Appendix A

Field Sampling and Analysis Plan

APPENDIX A

Field Sampling and Analysis Methods

Field sampling and analyses were conducted in two phases for the Ecological Risk Assessment (ERA). The first phase ("ERA Sampling") occurred in 1998-1999 to determine levels of constituents identified as Chemicals of Potential Ecological Concern (COPECs) and to conduct laboratory bioassays. The second phase ("Focused Sampling") occurred in 2000 to conduct more detailed analyses of previously sampled "random" locations (sampled as part of the ERA Sampling), and to identify the nature of contamination associated with previously identified sources (such as sumps, wells, pipelines, maintenance areas, etc.) and potential sources ("CAR Sites", explained below).

As described in the main text, the ERA for the Bolsa Chica Lowlands was designed to characterize the site and evaluate the actual or potential effects of contamination within the Lowlands on plants and animals residing in the Lowlands. Because most of the Lowlands varies seasonally from aquatic to terrestrial habitat, "sediment" and "soil" were combined and considered synonymous for sampling purposes so they are sometimes referred to as sediment/soil. Intense sampling and analyses of sediments, soils, and waters were conducted in order to identify the presence and concentrations of contaminants within biologically active zones, to determine whether exposure pathways to ecological receptors exist, to evaluate the actual and potential bioaccumulation of contaminants, and to determine no observed adverse effect levels. In addition, sediment/soil were collected and analyzed from below the biologically active zone in order to assess subsurface contamination for site characterization, but not for ERA purposes. Sediments and soils were collected from areas where contaminants are known or thought to exist (focused sites) as well as from other areas throughout the lowlands (random sites). Horizontal compositing was used to form sediment/soil samples from random sites during the ERA Sampling phase (as a cost-saving measure) but not during the Focused Sampling phase. Individual sites that formed a random composite containing elevated levels of one or more constituents were re-sampled as discrete locations during the Focused Sampling phase. Bay water, seasonal pond water, and storm water were collected for a variety of reasons associated with the ERA.

Activities associated with the ERA Sampling and Focused Sampling phases are discussed separately below.

ERA Sampling

Collection and testing during the ERA Sampling phase was conducted as outlined in Table A-1. The following is a summary of activities performed during the ERA Sampling in 1998 and 1999:

All cores collected at random sites for the ERA Sampling phase were advanced to 6 feet below ground surface (bgs) or greater; core depths varied for the different kinds of focused site, depending on the kind of facility.

Surface sediment/soil (top 0.5 feet) and sediment/soil from the future biologically active zones (0.0 to 2.0 feet below dredge depth in areas to be dredged) were collected, composited, and analyzed for a large suite of constituents (Suite C) at low detection limits (Table A-2). Suite C analyses were conducted on all randomly collected samples and on all samples collected from focused sites that were used for bioassays. Sediment/soil from 44 of the ERA locations (6 random composites and 38 focused sites) were subjected to an acute toxicity test using the adult amphipod *Eohaustorius estuarius*. Also, *Nereis viriens* (estuarine/marine worms) were exposed for 30 days to 24 of the sediments analyzed for Suite C in order to assess bioaccumulation. Tissues from these worms were analyzed for the Suite E list of constituents in Table A-2.

- Subsurface sediments (1.5 to 2.0 feet and 3.5 to 4.0 feet bgs) were collected, composited, and analyzed for a reduced list of constituents (Suite A) at screening-level detection limits (Table A-2). Suite A analyses were conducted on all randomly collected subsurface samples. No subsurface samples were collected from Inner and Outer Bolsa Bay. Most subsurface samples collected at focused sites were also subjected to Suite A analyses. Some of the subsurface focused samples were subjected to Suite B analyses (Table A-2), which is a further reduction in the list of constituents; these samples are identified in Table A-1.

- Pore water was extracted from a total of 46 sediment samples (24 random composites and 22 focused sites). The extracted water from each sample was then analyzed for the Suite D list of constituents in Table A-2. Each pore water sample was subjected to a survival and development bioassay using larvae of the mussel, *Mytilus edulis*.

- Surface water samples were collected from 5 locations. Each sample was analyzed for the Suite D list of constituents in Table A-2 and subjected to a larval growth and survival bioassay using the fish *Atherinops affinis* (topsmelt).

- Storm water runoff samples were collected from three locations during two separate events and analyzed for the same list of constituents identified for the surface water samples as well as organochlorine herbicides and pesticides.

- Fish, invertebrates, mammals, bird eggs, and plants were collected at designated locations throughout the Lowlands. Tissues from these organisms were prepared and analyzed for the Suite E or modified Suite E list of constituents in Table A-2.

More detailed descriptions of sampling and analytical methods used are in the following sections. Guidelines put forth in Appendix A of the *Confirmatory Sampling and Risk Assessment for the Bolsa Chica Lowlands Project Work Plan* (CH2M HILL, 2000) were followed.

In addition to the ERA Sampling, additional sediment samples for chemical analyses were taken for dredge material evaluation during 1999. Methods and results for the dredge material evaluation have been reported separately (Kinnetic Laboratories and CH2M HILL, 1999).

Focused Sampling

The Focused Sampling locations were divided into three main categories: 1) Random Follow-up Sites, 2) Previously Uncharacterized Sites (Cleanup Agreement and Release [CAR] Sites), and 3) Partially Characterized Sites. The Random Follow-up Sites are discrete locations selected randomly and sampled as composites during the ERA Sampling where the composite sample representing those locations had at least one analyte that exceeded a calculated LC_{20}. If an LC_{20} does not exist for a particular analyte, then the ER-L value published by Long et al. (1995) for that analyte was used as the exceedance criterion. If neither an LC_{20} nor an ER-L exists for an analyte, then the background level for that analyte was used as the exceedance criterion. The CAR Sites include the Plate 1 Schaefer-Dixon Anomalies (Schaefer Dixon, 1991). The Partially Characterized Sites are the focused facilities or features sampled by Tetra Tech (1996) for which some existing data were available. Sediments from those Partially Characterized Sites where bioassay and bioaccumulation studies were carried out were sampled during the ERA Sampling phase. Sampling and analysis were scoped differently for the three categories of focused sites and are discussed separately below. Sampling and analysis during the Focused Sampling phase was conducted as outlined in Table A-1.

Random Follow-up Sites

Each data point for all composite sediment/soil samples collected during the ERA Sampling was reviewed in detail. The decision was made to re-sample the individual locations making up a composite sample if one or more of the following criteria were exceeded in the composite sample:

- The concentration of total DDT in the composite multiplied by the number of samples making up the composite was greater than or equal to 20 µg/kg. Twenty µg/kg is a median value between the published ER-L and ER-M for total DDT. This was decided as an appropriate value rather than using the ER-L value because of the low confidence in the DDT value expressed by the publisher of that value (Long et al., 1995)
- The concentration of arsenic in the composite was greater than or equal to 20 mg/kg. Twenty mg/kg of arsenic is roughly twice the background level.
- The concentration of mercury was greater than or equal to 0.31 mg/kg. This concentration is about 25% higher than background levels.
- The concentration of selenium is greater than 0.54 mg/kg. This concentration is equal to the background level for selenium.
- The concentration of thallium is greater than 0.52 mg/kg. This concentration is equal to the background level for thallium.
- The concentration of any one of the other Method 6020 metals was greater than the calculated LC_{20} for that metal. If an LC_{20} does not exist for a given metal, then the background level was used.

- The concentration of an individual PAH compound or the concentration of total PAHs exceeded the calculated LC_{20} for that compound or for total PAHs. If an LC_{20} was not calculated for a PAH compound then the ERL for that compound was used.
- The concentration of di-n-octylphthalate was greater than 51.93 µg/kg. This concentration is equal to the calculated LC_{20} for di-n-octylphthalate.
- The concentration of TPH-diesel or TPH-waste oil was greater than the calculated LC_{20} for these constituents.

Most of the individual random sampling locations were re-sampled to a depth of 0.5 feet bgs. The only time boring depths were advanced to the original project depth of 6 feet bgs was if the bottom composite sample exceeded any of the above-stated criteria. Only those constituents that exceeded the above-stated criteria for any particular sample were reanalyzed. Table A-3 defines the constituents tested for each random sampling location re-sampled.

Previously Uncharacterized Sites

Once all the CAR sites were identified, the size of each site was estimated. Adjustments to the size of the sites were made if Tetra Tech sampled an overlapping sump or if a random sampling location fell within the CAR site boundary. CAR sites were characterized as follows:

- All borings were advanced to 6 feet bgs or greater.
- Samples from each boring were retrieved from three intervals: 0 to 6 inches, 30 to 36 inches, and 66 to 72 inches.
- The middle and bottom interval from each boring were combined into a single sample.
- For those CAR sites that were less than 1 acre, two borings were collected. However, if the CAR site was less than 0.1 acre then the two top samples were composited together and the two middle/bottom samples were composited together.
- For those CAR sites that were greater than 2 acres, one boring was collected for every acre. No horizontal compositing was conducted.
- All top samples were analyzed for the modified Suite C list of constituents (Table A-2).
- All middle/bottom samples were analyzed for the Suite B list of constituents (Table A-2).

Table A-4 defines the constituents tested for each CAR sampling location.

Partially Characterized Sites

The sampling and analysis plan for the focused facilities or features with some existing data varied from one kind of facility or feature to another. Sampling rates for all these Partially Characterized Sites were based on the estimated area or linear length of those facilities and features. Prior to making the final decisions on sampling rates, constituent lists to use, and depths below the ground surface, all Tetra Tech and CH2M HILL data were matched to the

list of facilities and features. These data were then used to determine whether any additional characterization was needed. All samples collected were analyzed for either the Suite A, Suite B, or the modified Suite C analytes as shown in Table A-2. No compositing was conducted on any of the Partially Characterized Sites. Site-specific sampling details for each facility or feature, including rationale for the sampling and testing done, are described below. Specific locations, numbers of samples, and analyses performed are detailed in Table A-5.

Suspected Sand Blasting Area

The formula to characterize this 1-acre facility[here the hyphen is correct] was to take 6 cores to a depth of 4 feet bgs. A surface, mid and bottom sample would be obtained from each boring. The Suite B list of constituents in Table A-2 were to be run on all samples except for one surface sample, which would be analyzed using the Suite A list in Table A-2. During the ERA Sampling phase, two of the six cores were collected for toxicity assessment. In addition, Tetra Tech (1996) previously collected two surface samples for metals, two surface samples for metals and organic compounds, and one 4-foot sample for organic compounds. The analytical results obtained from previous samplings were determined to be adequate, so no additional samples were collected during the Focused Sampling.

Tank Farms

There are three former tank farms within the Bolsa Chica Lowlands (North Bolsa Tank Farm, South Bolsa Tank Farm, and State Lease Tank Farm). The formula for characterizing these facilities was to collect 3 cores to a depth of 4 feet at each tank farm. A top, mid and bottom sample were to be collected from each boring. The three samples from the first core at each tank farm were to be analyzed for the Suite A list of constituents in Table A-2. All other samples were to be analyzed for the Suite B list of constituents in Table A-2. However, because one or two borings were previously collected during the ERA Sampling, and Tetra Tech (1996) collected one or three borings at each tank farm, no additional samples were collected at the tank farms during the Focused Sampling phase.

Old Kobe Area

Tetra Tech (1996) previously collected two borings to 4 feet at this facility. Because no samples were previously collected during the ERA Sampling phase, one additional boring was collected and analyzed during the Focused Sampling phase. The original formula to characterize this 1-acre facility was to take two cores to a depth of 4-feet bgs. A surface, mid and bottom sample was obtained from the single boring. The modified Suite C list of constituents in Table A-2 was run on the surface sample collected, and the Suite B list in Table A-2 was run on the middle and bottom samples collected.

Waste Handling Facility

Because this facility comprises most of CAR Site 112 (See Figure 3-2), cores were sampled and analyzed according to the CAR site plan, recognizing that three samples from this location were collected during the ERA Sampling.

Sumps

Tetra Tech (1996) identified 38 sumps throughout the Bolsa Chica Lowlands. The Work Plan (CH2M HILL, 2000) called for a minimum of two cores to be collected from each sump to 6-feet bgs. If a sump was greater than 2 acres in size, then 1 core per acre would be collected. A top, mid and bottom sample were retrieved from each core collected. The surface interval from the first core at each sump was analyzed for the modified Suite C list of constituents in Table A-2. All other surface samples at each sump were analyzed for the Suite A list of constituents in Table A-2. All middle samples were also analyzed for the Suite A list. All bottom samples were analyzed for the Suite B list in Table A-2.

After taking into consideration the 12 cores collected during the Random Sampling Program and the 45 cores collected by Tetra Tech (1996), 33 cores were taken to characterize the sumps.

Abandoned Oil Lines

There are approximately 14,000 feet of abandoned oil lines throughout the Bolsa Chica Lowlands. The Work Plan (CH2M HILL, 2000) called for a transect of 3 surface samples to be collected every 2000 feet along the oil lines at a right angle to the oil lines. Each sample was analyzed for the Suite B list of constituents in Table A-2. In addition, every-other sample obtained was analyzed for organochlorine pesticides and PCBs. Three locations were previously sampled at the transect locations bringing the total number of samples that were collected and analyzed to 18.

Existing Oil Lines

Because oil lines outside of the full tidal area would not be removed in the near future, a decision was made to sample only those oil lines within the full tidal area. There are approximately 30,000 feet of oil lines within the full tidal area. A surface sample was collected every 2000 feet along the oil lines. Each sample was analyzed for the Suite B list of constituents in Table A-2. In addition, every-other sample obtained was analyzed for organochlorine pesticides and PCBs. After giving credit to previous samples collected along the pipeline there a total of 11 locations were sampled.

Wet Gas Lines

The results of the previous Tetra Tech (1996) sampling effort revealed 5 locations along the wet gas lines with considerable contamination. It was decided to avoid these locations until a future "Delineation Phase" of sampling. Outside of these contaminated locations, there are approximately 19,000 feet of pipeline that have been partially characterized. After giving credit to previous samples collected along the gas lines, 10 surface samples were collected every 2000 feet along the wet gas lines. Each of these samples were analyzed for the Suite B list of constituents in Table A-2 plus organochlorine pesticides and PCBs.

Pig Cleanout Areas

There are three pig cleanout areas at Bolsa Chica. Previous sampling efforts during the Random Sampling Program and by Tetra Tech (1996) have been sufficient for characterizing these sites for ERA purposes. No additional samples were collected during the Focused Sampling Program.

Dry Gas Line

There are approximately 5,500 feet of dry gas line within the full tidal area that would have to be removed in the short term. The Work Plan (CH2M HILL, 2000) calls for a total of 6 surface samples that are necessary to fully characterize the dry gas line within the full tidal area. Since Tetra Tech (1996) previously collected three surface samples, three additional surface samples were collected during the Focused Sampling Program. These three were analyzed for the Suite A list of constituents in Table A-2 plus organochlorine pesticides and PCBs.

Roads and Berms

There are over 163,000 feet of roads and berms within the Bolsa Chica Lowlands. Previous sampling efforts during the Random Sampling phase and by Tetra Tech (1996) have been sufficient for characterizing the roads and berms. No additional samples were collected during the Focused Sampling phase.

Oil Wells

Previous sampling efforts have been sufficient for characterizing the oil wells in the Bolsa Chica Lowlands for ERA purposes. Also, the potential for the chemical characterization of the oil wells to change prior to removal is too great. No additional samples were collected during the Focused Sampling.

Urban Inflows

There are four inflows identified for surface sediment sampling. Three out of the four were sampled during the ERA Sampling phase. A single surface sample was collected during the Focused Sampling phase to characterize the fourth location. This sample was analyzed for the modified Suite C list of constituents in Table A-2.

Storm Water Samples

In addition to the samples collected for storm water during the 1989-1999 ERA Sampling, additional runoff samples were collected from four locations during a single event in 2000 and analyzed for the same list of constituents identified for the surface water samples (Suite D in Table A-2) as well as organochlorine herbicides and pesticides. Each of these storm water samples was also subjected to a 7-day bioassay. Two of the samples, which were predominantly fresh water, were subjected to a survival and reproduction bioassay using *Ceriodaphnia dubia*. Because the two other samples had salinities outside of the tolerance of *Ceriodaphnia dubia,* survival, growth, and reproduction bioassays using *Mysidopsis bahia* were conducted instead.

Site Selection

The Bolsa Chica Lowlands area is divided into some sixty cells based upon topography and land use (Figure 3-1) and a Conceptual Restoration Plan was produced as an overlay to this base map of the Lowlands (Figure 1-2). The base maps are the topographic maps generated by aerial surveys of the Lowlands flown in 1980 and 1986, along with surface control surveys from late 1996.

One goal in selecting sampling locations was to sample across all cells to determine the spatial distribution of COPECs (identified in Sections 3 and 5 of the Work Plan; CH2M HILL, 2000) and the background concentrations for inorganic elements. Sampling locations were also selected to include some suspected sources or high concentration areas, as identified in the previous investigations conducted at the Lowlands (Schaefer Dixon, 1991; Tetra Tech, 1996). These focused areas were included in this ERA process so that a full range of concentrations of COPECs present in the lowlands would be sampled for the biological effects testing.

For the ERA random sampling areas, each cell within the lowlands was divided into a stratified grid of subareas within each cell. A stratified grid density of approximately one sample location per 4 acres was specified, appropriately adjusted or rounded for given lowland cells. Random sampling points within these stratified grid subareas were then chosen by a random number method, with one sample location being located within each stratified grid. If focused sites (areas of suspected contamination) existed within a given grid, these were excluded from the ERA Sampling.

For Focused sampling areas, the three main site categories were selected as follows: (1) Random Follow-up sites are discrete locations sampled during the ERA Sampling where the composite sample representing those locations had at least one analyte that exceeded either LC20, ER-L or background level of that particular analyte; (2) CAR sites; and (3) the Partially Characterized Sites are the focused facilities or features identified by Tetra Tech (1996) for which some existing data were available.

Field Methods

This section describes the methods and handling procedures for the collection of soil/sediment, water (surface, storm and pore water), and biological tissue (plant and animal) at Bolsa Chica. All field activities performed under the scope of this project conformed to State and other applicable regulatory agency requirements. Soil and sediment collection, handling, and preservation followed EPA/COE (1991, 1998) guidelines.

Site Positioning

Psomas, Inc., using a Differential Global Positioning System (DGPS) referenced to local geodetic benchmarks, surveyed the random and focused sampling points. This DGPS results in a horizontal accuracy of about $\pm$ 1 cm. Vertical control was referenced to Mean Sea Level (MSL) with an accuracy of about $\pm$ 2.5 cm.

Prior to sampling the random locations, stakes were placed at specified locations. In the event that locations had to be moved due to adverse field conditions and/or obstructions, distances and bearings from the marked locations were noted, and in most cases, the new locations were staked and then re-surveyed. The opposite approach was taken for locating focused sampling sites. Maps were used to approximate the focused locations. The field teams then judgmentally located and then marked the sampling locations using physical features in the area. Afterwards, the focused locations were surveyed and positions and elevations were documented.

Because of deep water, Psomas, Inc. could not mark some locations such as those in Inner and Outer Bolsa Bay. Instead, a hand-held Garman DGPS referenced to correction signals provided by the US Coast Guard was used. Horizontal accuracy with this instrument was in the neighborhood of $\pm$ 3 meters. In most cases, mudline elevations were not obtained when using the hand-held DGPS. The depth of water was recorded instead.

Sediment/Soil Sampling Techniques

Sediment/soil sampling was performed from a variety of work platforms based upon the physical topography and/or physical obstructions (i.e. pipe racks). An all-terrain truck with large tires (later modified with tracks to minimize surficial damage to the lowlands), a stinger crane for those locations within reach from roadsides, and a small barge were used to collect the cores in the Lowlands, as appropriate to the particular location. The truck and barge platforms were outfitted with a 12–ft-high quadrapod and 1-ton electric winch for lifting.

Using different technologies, a single boring was collected to project depth from each randomly located site within Bolsa Chica. At most random locations, a vibracore was the primary device used to collect soil and sediment samples to a project depth of 6 feet bgs. Random locations within Inner and Outer Bolsa Bay and within the preferred dredge footprint were an exception to this. The top 6 inches was the sampling interval in Inner and Outer Bolsa Bay. Sediments from these locations were collected using a 0.1 m^2 modified, Kynar® coated Van Veen grab. The project depth within the preferred dredge footprint was –6.8 feet MSL for dredge evaluation purposes. The 2 feet below dredge depth, which represents the future biologically active zone, was collected for ERA purposes. Sometimes a core was advanced to 30 feet bgs for geotechnical purposes related to the dredge evaluation. A large and small vibracore were primarily used to collect sediments within the preferred dredge footprint.

All focused sites were sampled using a large vibracore or Rhino Driver to a project depth that varied from 3 to 8 feet bgs depending on the type of oil field activity that had occurred at that site. Tables A-3 through A-5 list the project depth for each type of focused facility or feature sampled.

At most locations, the vibracore was used to collect a single continuous vertical sample. However, at some locations, where surface soils were harder and more compact than soils at depth, hand coring was used to obtain the upper interval. Usually this was accomplished by pounding a short, decontaminated 4-inch core tube through the hard layer to a depth ranging from 0.5 to 2.5 feet bgs. Then, if the hole remained open, the vibracore tube was advanced from the hand coring depth to project depth. If the hole collapsed, than a shovel was used to dig a pre-bore to hand core depth. At other locations, where soils are particularly hard and compact through the entire sampling interval, a pneumatic driven Rhino Driver was used to advance a 4-inch diameter aluminum tube into the soil to collect a single continuous vertical sample. If surface soils were extremely hard, such as those found on roads, then a gasoline powered two-man rotary auger was used to break through the harder soils and open up a pre-bore for the vibracore. If this method was used, then the top 6-inch sample was obtained by scraping the sides of the pre-bore hole with a decontaminated stainless steel spoon. A preliminary scrape was done first to remove any possible contamination left from the auger operation.

At locations where extra surface material (top 0.5 feet) was needed for toxicity tests, bioaccumulation exposures, and/or pore water extraction was needed, a stainless-steel shovel and/or Kynar® coated Van Veen grab was used to collect the material. This material was placed into 3.5-gallon plastic-lined buckets for later compositing. At random locations where horizontal compositing was called for, the total volume of extra surface material needed was derived from equal portions of material collected at each location within a compositing area. In the rare instance that a focused site sampling location was covered with a film or oil/tar conglomeration, sediment used for pore water, bioaccumulation, and toxicity analysis was extracted from just underneath this substance.

Vibracore Equipment

Both large and small vibracore systems specially designed by Kinnetic Laboratories were used to collect core samples. The smaller system was only used in extremely soft and saturated sediments. Both systems utilized 4-inch diameter aluminum coring tubing, a stainless steel cutting tip, and a stainless steel core catcher. The vibrating unit for the larger system has two counter-rotating motors encased in a waterproof aluminum housing. The motors are powered electrically by a 3-phase, 240V generator. The vibrating unit for the smaller system consisted of a single 120V AC motor with an unbalanced flywheel.

Both vibracore systems were vibrated down until the desired penetration was met or until the unit was rejected by a hard, consolidated substrate. After successfully penetrating to the desired depth or in vary rare cases when rejection was met, power was shut down to the vibrating head and the unit was pulled out of the bore hole. A check valve, located on top of the core tube helped prevent the loss of sediment during pull out. Once recovered, the core tube was detached from the vibro-head, and the tube was then capped in a declined position and transported to the designated processing area.

Sediment Sample Processing and Compositing

Once at the designated processing area, two general methods of extrusion (manual extrusion, pre-applied polyethylene tubing) were used to extract the core from the aluminum tube. The manual extrusion method consisted of the use a manual lever and/or gravity to extrude the core from an aluminum tube. The core was secured in an inclined position and the core tip and catcher were removed. A decontaminated Teflon and stainless-steel plunger was inserted into the tube to the top of the sediment and pressure applied to the lever forcing the plunger down the tube until the core exits the bottom of the aluminum tube. The core was extruded onto a clean polyethylene-lined trough. Should this procedure have failed or deemed inappropriate due to side-wall friction within the aluminum tube, it was split lengthwise to gain access to the core. Double-cut shears, which leave no metal shavings, were used to split the cores in these instances. The pre-applied polyethylene tubing method consisted of inserting a 4”diameter, 6 mil polyethylene tubing into the aluminum tube prior to insertion into the ground. The polyethylene tubing acts as an internal sleeve to capture the core. Once the core had been extracted from the ground and placed in an inclined position, the core tip and catcher were removed and the encapsulated core extracted by pulling the bottom of the polyethylene liner. Once on the ground, a stainless- steel scissors or knife was used to cut the polyethylene sleeve lengthwise to gain access to the core.

Once access was gained to the core, the outer layer of sediment, which comes in contact with the core tube or polyethylene tubing, was scraped off with a decontaminated stainless-steel knife or spoon. Each core was then photographed in its entirety. The length of recovered sample was verified by measuring the core length. Observations were noted as to the length of core, sediment horizons, sediment characteristics, color, odor, native/virgin sediment origin, and visually inspected for free product, staining, and other anomalies that were not believed to be indigenous to the matrix. Lithologic descriptions were made in accordance with the unified soil classification system (USCS). All descriptions were documented on individual core logs. In addition to lithologic descriptions, the following information was also recorded: station identification, date and time, general observations of conditions, climatic conditions, total coring time, boring coordinates (if hand-held DGPS was used), core identification, core length penetrated, core length recovered, core length required, sample type, sample stratification intervals, and tidal stage and water depth (if pertinent). Completed core logs for each sampling location can be found in Appendix B. When observations were completed, a determination was made of the segments for sediment sampling, according to the approved work plan.

Before sub-sampling began, a portable Photoionization Detector (PID) was used to screen each core for volatile organic compounds. A representative sample from each interval was collected and placed into a zip-lock bag and allowed to equilibrate. The PID probe was then inserted into the bag headspace, and the reading was recorded.

At random locations other than Inner and Outer Bolsa Bay and the alternative dredge area, individual samples were taken from three intervals below the ground surface or mudline elevation (0.0-0.5 feet bgs, 1.5-2.0 feet bgs, and 3.5-4.0 feet bgs), or from a single interval two feet below project depth for those ERA samples taken in the preferred dredge area. In Inner and Outer Bolsa Bay and the alternative dredge area, only a surface interval was collected for ERA purposes. Both vertical and horizontal compositing were used in all cases. One to six coring locations made up a horizontal composite. The surface intervals, or bottom intervals for locations in the preferred dredge area, from all cores within a compositing subarea were combined together into a single composite for Suite C analyses. The middle and bottom intervals from all cores within a non-dredge compositing subarea were combined together into a single composite for Suite A analyses. Sampling intervals and processing procedures for the material collected above dredge depth in the preferred and alternate dredge areas are discussed in a separate report (Kinnetic Laboratories and CH2M HILL, 1999). Any material recovered that was not shipped to the lab for analysis was discarded into a DOT approved container for later disposal.

No horizontal compositing took place with the focused cores. Instead, samples were taken from one to three discrete intervals. The sampling intervals and the chemical analyses performed on each interval for each type of focused location are summarized in Tables A-3, A4, and A-5.

To prepare each composite, sample handlers wearing powder free Nitrile gloves used clean spoons to transfer the central portion of each core interval into a protocol cleaned Teflon tray or bucket for compositing. If a grab sampler was used, the overlying water was siphoned off prior to the removal of sediment. A separate tray or bucket for each composite sample was used. Once a representative amount of each core (or grab) had been transferred to the compositing container, the sample(s) were thoroughly mixed until a uniform texture

and color was obtained. Samples were then transferred into certified clean glass jars and sealed with Teflon lined screw caps. All sample containers, except those for dissolved sulfides, were immediately put on ice and kept at 2-4°C until analyzed. The dissolved sulfide samples were frozen and kept frozen until analyzed.

All samples were handled under full chain of custody control. Samples were marked with pre-printed, self-adhering labels containing unique number/letter combinations to facilitate sample tracking. These labels were placed on each sample container and covered with clear tape to prevent peeling or damage to the label. Duplicate information was placed on the chain of custody which included: matrix, type of analysis to be performed, date and time of collection, station identification, and collector's initials.

Preferred Dredge Area Pore Water Collection Procedures

Pore water samples from the preferred dredge area were collected in situ using a stainless-steel well point with a 2 ft screened interval. The well point was driven to the desired depth (the 2 foot zone below dredge depth) and the outer stainless steel casing was retracted exposing the well screen. Once in place, the temporary well was allowed to recharge. The well was purged clear of water and allowed to recharge three times before samples were drawn. Purging and sample collection took place using a peristaltic pump with pre-cleaned Teflon tubing.

Pore water collection in the preferred dredge area followed the same compositing scheme used for the soil and sediment samples. Equal portions of pore water from each location within a compositing subarea were pumped into protocol cleaned 10-Liter bottles. The 10-Liter bottles were then shipped to Toxscan, Inc. in Watsonville, CA where suspended particles retained in the sample were centrifuged out. The clarified water was then subsampled into appropriate containers according to the analyses to be performed.

Surface Water Collection Procedures

Surface water samples were collected from five locations throughout the Bolsa Chica Lowlands. These locations included tidally-influenced water bodies, permanent freshwater ponds and channels, and seasonal ponds. Sampling locations are depicted on Figures 3-1 and 3-2. Prior to collecting a water sample, field parameters such as dissolved oxygen (DO), pH, temperature, specific conductivity, and turbidity were measured using field meters to determine if stratification existed in the water column.

Surface water samples were taken by the use of grabs or pumps. For shallow surface water, grab samples were taken directly into pre-cleaned sample bottles with appropriate care not to disturb sediments. For deeper tidal waters, similar grab samples were taken with a Valscon sampler, which opens and closes a Teflon-sealed, pre-cleaned sample bottle at depth to obtain the sample. For large volume water samples needed for bioassay purposes, a peristaltic pump using pre-cleaned Teflon hose was used.

All surface water samples were labeled with a unique sample identification number, the project number, client's name, sampler's name, the requested analyses, and the date and time of sample collection. The samples were visually inspected for any signs of contamination. The samples were then stored on ice or refrigerated until delivery to the analytical laboratory.

Storm Water Collection Procedures

Storm water runoff samples were collected at three or four locations during two storm events in 1998-1999 and one storm event in 2000. Sampling locations are depicted as "SW" samples on Figures 3-1 and 3-2. Because of the lack of flow, Site SW-02 could not be collected during either 1998-1999 event. Samples were collected using the same grab sampling techniques described above for the surface water samples.

Decontamination Procedures

Decontamination procedures of field sampling equipment and utensils consisted of either a chemical wash or steam cleaning. Chemical decontamination procedures were as follows:

1. Micro R® soap wash and scrub.

2. DI Rinse

3. 10% HNO3 rinse

4. DI Rinse

5. Acetone Rinse

6. Hexane Rinse

7. Air Dry

Steam cleaning decontamination procedures were as follow:

1. Micro R® soap wash and scrub

2. Steam Clean

3. DI Rinse

Equipment rinseate samples were collected from each sampling apparatus to evaluate the decontamination procedures and the resulting cleanliness of the sampling equipment. The rinseate samples were collected after a sample collection device was subjected to standard decontamination procedures. Deionized water was poured over or through the sampling device after decontamination and collected in the appropriate container for analysis.

Plant and Animal Collection for Tissue Chemistry (Bioaccumulation)

Analysis of plant and animal tissues provides a direct measure of contaminant bioaccumulation and reduces uncertainty in the risk assessment (as well as risk management decisions).

The assumption for body-burden sampling is that the major exposure route of terrestrial vertebrates will be through feeding on plants or invertebrates that have bioaccumulated metals, organochlorine pesticides, or PAHs from on-site soil. For aquatic animals, the assumption is that the major exposure route to contaminants will be direct uptake of water (across gill membranes or integument) or through feeding on organisms living in the water or sediments. For plants, the assumption is that the major exposure route is via root uptake from the soil or sediment.

Biological tissue samples were collected from the same locations as media samples, if possible. Biological sampling usually required an expanded areal coverage centered on the site for soil, water, or sediment sampling because of the dispersed nature of the biota and the need to composite an adequate weight of organisms for analysis. Plant and small mammal tissue were collected at locations where soil samples were collected. Benthic infauna was collected at locations where sediment samples were collected. Fish and water-column invertebrates were collected at locations where surface water samples were collected. Analytical results were used to directly relate chemical concentrations in biological tissues to chemical concentrations in the environment.

Several special-status species occur on the Bolsa Chica Lowlands and appropriate measures were taken so that these species were not disturbed during field activities. Worker training, consultation, and permits were acquired from the appropriate local, state, and federal resource agencies prior to the field sampling effort.

Benthic (Epibenthic) Invertebrates

Aquatic macroinvertebrates were captured using a variety of equipment including hand collection, kick nets or dip nets. Individuals were sieved and washed from the sediment with ambient water, placed in clean containers, and frozen for whole body analysis of contaminants. Only those samples with sufficient weight for analyses were saved for chemical analysis. Samples were stored and shipped frozen.

Samples were sorted to species and up to three of the most common species were collected as single samples per species from any given station. Only those species with sufficient biomass for chemical analysis were collected.

Field conditions at the Bolsa Chica wetlands proved difficult for traditional macroinvertebrate collection techniques. For example, extremely soft sediment and shallow water environments were common but also precluded effective wading or boating techniques. Each site was evaluated in the field. For this reason, a variety of collection techniques were used. Kicknets were scraped along the substrate and a shovel was necessary to sample larger infauna in some substrates (e.g., grass shrimp). Many common organisms were collected by hand (e.g., snails and mussels).

Voucher specimens were collected for each species sampled and stored in glass containers with formalin.

Fish

Fish were also captured using a variety of equipment including seines and dip nets. Fish collected were sorted by species and placed in clean containers. As was true for the invertebrates, the choice for the final fish collection method was dictated by site conditions. Samples were frozen for whole body analysis of contaminants. Only those samples with sufficient volumes for analyses were saved for chemical analysis. Samples were stored and shipped frozen.

The focus was on small fish (under approximately 6 inches in length), which were handled and stored as discussed above. All samples were cooled in the field and frozen as soon as possible.

One voucher specimen for each species was retained and preserved in a glass container with formalin.

Terrestrial Invertebrates

Insects and other terrestrial invertebrates (e.g., snails, sowbugs) were collected by sweep nets or by hand from vegetation where they could be eaten by insectivores (especially birds and mammals). Habitats under rocks, boards, or debris were searched as well, to obtain adequate weight for analysis. Pitfall traps were used at some sites where biomass was low. Samples were separated in the field into general, lowest practical taxonomic groups such as family or order and placed in clean sample containers. Only those samples with sufficient volumes for analysis were saved for chemical analysis. Samples were stored and shipped frozen.

Plants

Plants were collected for bioaccumulation analyses at selected sites. Soft portions of plants that were above the sediment or soil, with the exception of woody tissue, were collected for analysis. Dominant plant species were identified and recorded in the field; voucher specimens were collected for confirmation. Observations of plant vigor were noted. Plant samples were collected by hand, using plant shears with stainless-steel blades. Samples were placed in clean containers, and frozen. Only those samples with sufficient volumes for analysis were saved for chemical analysis. Samples were stored and shipped frozen.

Bird Eggs

Bird eggs were collected by hand from the nests of black-necked stilts nesting in the immediate vicinity of the collection sites. An attempt was made to collect eggs from throughout the Bolsa Chica Lowlands where stilts are nesting. Special care was taken to minimize disturbance of nesting snowy plovers. One egg was collected per nest. The eggs were analyzed as individual samples. Embryos were examined externally for obvious deformities, embryo age was estimated, and egg contents were weighed. The samples were placed in chemically-cleaned containers and stored and shipped frozen.

Small Mammals

Small mammals were live-trapped using Sherman live traps. Trap lines were set in selected areas of sites where high concentrations of COPECs were identified or in areas that were characterized for contamination. Traps were maintained daily and set for a minimum of 3 nights to obtain a representative sample. Only those species identified as target species (harvest mice and house mice) were saved for chemical analysis. A sample consisted of 3 to 5 animals to be composited by the laboratory. Samples were placed into chemically-cleaned containers and frozen. All samples were stored and shipped frozen.

Analytical Methods

The following sections describe in general the laboratory methods that will be used for testing and analyzing the water, soil/sediment, and tissue samples collected at the Lowlands. Additional QA/QC procedures are described in detail in Appendix C.

Chemical Analyses Methods for Sediments, Waters, and Tissues

Chemical analyses of sediment, water, and tissue samples were conducted using methods acceptable to the Corps of Engineers and the U.S EPA. The constituents analyzed and the methods used are summarized in Table A-2.

Petroleum hydrocarbon and volatile organic compound analyses were conducted by Columbia Analytical Services, Redding, CA. ToxScan, Inc., a California State-certified analytical testing laboratory, carried out all other analyses.

Analyses of the bulk sediment were conducted using composite samples. In addition to grain size distribution and total organic carbon, the composite samples from the proposed dredge area and select samples from the Reference sediments were analyzed for heavy metals (As, Ba, Be, Cd, Cr, Co, Cu, Pb, Hg, Ni, Se, Ag, Ti, V, Zn); chlorinated pesticides and PCBs including selected PCB congeners; petroleum hydrocarbons; oil and grease; semivolatile organic compounds including polynuclear aromatic hydrocar-bons (PAHs), phenols and phthalates; percent solids; pH; specific conductance; ammonia; sulfate; total volatile solids (TVS); and total and soluble sulfides. Volatile organic compounds were analyzed in surficial soil samples as part of Suite A. Table A-2 contains a list of all sediment parameters and the target reporting limits. Water and tissue samples were analyzed for a similar, subset of parameters analyzed in the sediment samples (Table A-2).

The analytical methods used for all media are also summarized in Table A-2 and are briefly described below.

Sediment Grain Size, Percent Moisture and Total Volatile Solids. Sediment grain size was determined using the methods described in Plumb (1981), which include size separation by screening plus settling tests for finer fractions. Percent moisture was determined by drying to constant weight at 105 °C. TVS was determined by heating to constant weight at 550 °C.

Conductivity, pH, and Total Ammonia. Following the method of 9045B (EPA, 1992), pH and conductivity were determined by mixing a 4:1 DI water:sediment slurry and measuring the parameters in the water phase using a standard Fisher laboratory pH meter. Ammonia was determined two different ways. About half the samples at the beginning of the project were determined by Method 350.2 (EPA, 1986) which involved distillation of the free ammonia from the sediment (pH adjusted to 11) into a dilute acid trap followed by colorimetric determination using Nessler Reagent. The second half of the samples had ammonia measured in a 5:1 2N KCl:sediment extract using an ammonia Ion Selective Electrode (Orion Ammonia Electrode, Model 95-12) following Method 350.3 (EPA, 1986).

Total and Soluble Sulfides and Sulfate. This method was adapted from EPA Method 9030 (EPA 1983) and Standard Method 4500-S-2-E (APHA 1995). Sediment samples were mixed with O2-free DIW, and treated in a manner similar to aqueous samples. Hydrogen sulfide present in aqueous samples was purged into a zinc acetate trap using nitrogen gas. The sample pH was adjusted to about 4 if total sulfide was to be determined, or left -un-adjusted for free sulfide determinations. The zinc sulfide precipitate in the trap was oxidized with a known and excess amount of iodine, and the unreacted iodine was back-titrated with thiosulfate.

Total sulfates were determined by extracting the sediments with DI water on a 5:1 water:sediment basis and analyzing the extract using Ion Chromatography according to Method 300.0 (EPA 1986).

Oil and Grease, Total Extractable Petroleum Hydrocarbons (TEPH). The analysis for oil and grease (hexane extractables) followed EPA Method 1664 HEM (EPA, 1995). The samples were extracted with hexane and the extract was collected in a tared flask. The hexane was evaporated over a steam bath until only residue remained. The flask was cooled in a desiccator and weighed. The increase in flask weight represents the amount of extractables found, and the results in parts per million can be calculated from the original sample weight. TEPH was analyzed by Columbia Analytical Services by extraction using sonication techniques with methylene chloride followed by chromatography using GC/FID (EPA Method 8015M) against known extractable TPH standards like diesel fuel and motor oil.

Total Organic Carbon (TOC). Analysis for total organic carbon followed the method of Gaudette, et al. (1974). One-to-two grams of sediment were placed in a 500 ml flask to which 10 ml of potassium dichromate (K2Cr2O7) had been added. Twenty ml of concentrated sulfuric acid (H2SO4) was then added while the flask was swirled. After 30 minutes, the sample was diluted to a volume of 200 ml with de-ionized water (DIW), and 10 ml of phosphoric acid (H3PO4) and 0.2 g of sodium fluoride (NaF) were added. After more swirling, 15 drops of diphenylamine indicator was added and the sample was titrated with 0.5N ferrous ammonium sulfate.

Metals. Analyses for metals utilized EPA Method 6020 and methods in the EPA 7000 series, performed with a Fisons Plasma Quad I ICP/MS and a combina-tion of the following Varian spectrophoto-meters: SpectrAA 400P or 400Z with GTA 96 a Graphite Furnace and autosampler; or a SpectrAA 10 with VOA 76 hydride cold vapor generator and flame autosamplers. Sample preparation prior to analysis by atomic absorption was accomplished by guidelines specified by Chapter 3, Sections 3.2 and 3.3, 7000 series (EPA 1986). Prior to analysis of seawater or high saline waters, a chelation extraction was performed following the methods of Bruland and Franks (1979).

Chlorinated Pesticides and PCBs. Analyses for these constituents were determined by Method 8081 (EPA 1992). A solid sample was mixed with anhydrous sodium sulfate and extracted using acetone/methylene chloride in a sonication extractor. The extract was then dried, concentrated, and underwent mercury and Florisil clean-up procedures (and GPC cleanup as needed). The extract was then analyzed by a gas chromatograph equipped with dual electron capture detectors. PCB congeners were determined separately on a second GC using different chromatographic Programming.

Semivolatile Organic Compounds. Analyses of semivolatile compounds in soil/sediments and tissues were conducted by GC-MS techniques, following Method 8270B (EPA 1992). A solid sample was mixed with anhydrous sodium sulfate and sonicated in methylene chloride. The extract was then concentrated and cleaned up by gel permeation chromatography. After extraction, the sample was injected into a gas chromatograph and the effluent was detected by mass spectroscopy. The EPA 8270B method was modified slightly by the use of Varian Selective Ion Storage technique that eliminates interfering ions from the sample spectrum.

Porewater Extraction Methods

Porewaters were extracted from composited sediment samples by centrifugation at 40C for 30 minutes at 2500 x G in a Sorvall Model Super T-21 Refrigerated Centrifuge. Sediments were spun in high-density polyethylene centrifuge bottles with approximately 700 ml capacity. The swinging-bucket rotor allowed processing of four bottles in each 30-minute centrifuge run. A total of 4.2 liters of porewater was required in order to perform the specified chemical and biological analyses for each sample. This quantity of porewater was produced for all but two of the sediment samples. The yield of porewater from samples FWH-1-1 and FWH-2-1 was between 35 and 50 ml from each liter of sediment centrifuged, and it was obvious that the amount of porewater necessary for analysis could not be extracted from the 34-liter volume of sediment available. With concurrence from the KLI field manager, the decision was made to not perform porewater bioassays on these two samples.

Pore waters from depth in the dredge area were taken 1 foot below the dredge depth at the level of the proposed new biotic layer. Pore water from these areas and depth were taken by in-situ extraction methods described above in the sediment sampling section.

Dry Samples and/or Sample Salinity Adjustments

In order to provide a test environment within the tolerance range of the test organisms, salinities of some of the porewater or sediment samples were adjusted. In addition, some samples were received in a dry condition and needed to be hydrated before testing.

Sediment samples were received at the laboratory either wet or dry, and were designated for one or more of the following biological assessments:

- Bivalve larvae bioassays using the porewater extracted from the sediment
- Amphipod bioassays using the whole sediment
- Bioaccumulation assessments using the whole sediment

Some of the sediment samples were taken from areas of the Bolsa Chica lowlands which are now dry, but that will be flooded in the future. It was desired to obtain a range of samples from areas containing a range of concentrations of contaminants of concern for use in the ERA biotesting Program. Therefore, some samples were received at the laboratory in a dry state. These dry sediments were treated essentially the same for all tests.

For bivalve larvae bioassays on these samples, laboratory seawater was mixed into the dry sediments during the compositing process to "create" porewater. Such "created porewater was allowed to equilibrate for 10 to 20 days under cold (40C) and dark conditions prior to extraction.

For bivalve larvae bioassays, porewater was extracted by centrifugation and frozen until tests were initiated. If salinity was outside the range of tolerance of the larvae, the porewater was either diluted with deionized water to 28-32 ppt or, in the case of hyposaline porewater, seawater brine was added to increase salinity to 28-32 ppt.

For amphipod bioassays, dry samples were covered with laboratory seawater overnight, and the resulting porewater was extracted the following day for salinity measurement. For

samples that were wet when received, these samples were extracted as received and porewater salinity was measured. If salinity of any of these samples was outside the tolerable range for the test amphipods (5-34 ppt), it was adjusted by overlying the sediment with 8 liters of water of "appropriate" salinity i.e., if initial interstitial salinity was very high, overlying water was diluted seawater at 5, 10, or 20 ppt. The overlying water was renewed daily and porewater salinity measurements were continued until tolerable salinities were attained. The static 10-day bioassays were then initiated by adding animals to the sediment.

For bioaccumulation exposures, approximately 3 liters of sediment were placed in laboratory flow-through aquaria and seawater flow was initiated. Interstitial salinity was measured after one day and, if appropriate for the test organism (10-40 ppt), the worms were added. If salinities were too high, seawater flow was continued at a rate of 5-6 tank volumes/day until appropriate salinities were attained.

Details of hydration and of salinity adjustments are given in Appendix F, Bioassay Reports.

Methods for Pore Water Toxicity Tests Using *Mytilus edulis* Larvae

The test protocol for mussel larvae was as specified by ASTM (l989) modified for small volumes by California EPA (1996). Gravid mussels, supplied by Carlsbad Aquafarms, Carlsbad, CA, were induced to spawn by thermal stimulation. Eggs and sperm were collected in separate beakers filled with 1 mm-filtered seawater. After inspection, gametes from multiple individuals were screened and pooled. Egg density was determined by microscopically counting several 1-ml aliquots taken from the well-mixed egg beaker. Fertilization was accomplished by addition of an appropriate amount of sperm suspension. Beginning approximately one hour after sperm addition, several aliquots of the embryo suspension were examined to confirm density and to assess fertilization success. Tests were initiated when at least 90% fertilization was observed, within four hours of fertilization in all cases.

The control exposure, performed for quality assurance purposes, used sea-water from our laboratory system. Four replicate containers were used for each test exposure. Temperature, dissolved oxygen, pH and salinity were monitored in "surrogate" containers of each test concentration and controls at the beginning and end of the test and daily during the test exposure.

Larvae were tested at 15□C in 100 mm borosilicate glass test tubes containing 10 ml of test solution. After adequate fertilization was confirmed, an aliquot of fertilized eggs was pipetted into each test tube. Five extra test tubes were prepared in addition to those required for test and control replicates and for monitoring surrogates. These "extra" test containers were not incubated, but rather they were evaluated immediately after inoculation to provide the "initial recovery" data used to establish the mean number of embryos added to each test container.

At the end of the 48-hour exposure period the contents of each test tube were preserved with 0.25 ml of 37% formalin in preparation for microscopic evaluation. Each tube was inverted at least five times to promote uniform mixing of contents, and then rapidly subsampled with a 1 ml Eppendorf pipette. The 1 ml subsample was placed onto a Sedgwick-Rafter counting slide and the total number of normal and abnormal larvae was determined. Larvae were scored for evidence of internal tissue inside a complete larval

shell. Larvae that had a complete larval shell containing tissue were counted as normal, whereas empty shells and larvae with incomplete shells were scored as abnormal. On the assumption that abnormal larvae would not survive, abnormals were counted as mortalities. Data were reported as percent of initial embryos that survived, and percent of survivors that showed normal development, as calculated below.

The raw data resulting from these bioassays included the following:

- Counts of embryos added to five replicate test containers that were not incubated for 48 hours (= initial recovery).
- Counts of normal and abnormal embryos from test containers (four replicates per sample concentration and control) which were incubated for 48 hours.

The results for each replicate were calculated from these data as follows:

$$\%\ survival = \frac{No.\ normal\ larvae\ recovered}{N} x100$$

where N = the mean initial number of embryos added (from initial recovery data).

For each test chamber other than controls, % survival data were adjusted to correct for mortality observed in the control exposures by use of Abbott's correction:

$$corrected\ sample\ \%\ survival = 100 - \left(\frac{mean\ \%\ control\ survival - \%\ sample\ survival}{mean\ \%\ control\ survival} x100 \right)$$

Percent normal development data were similarly adjusted.

Methods for Whole Sediment Acute Toxicity Tests Using *Eohaustorius estuarius*

Test sediments were bioassayed simultaneously with home control sediments. The amphipod *Eohaustorius estuarius* was tested following procedures outlined in ASTM (1990). *E. estuarius* were supplied by Northwestern Aquatic Sciences, Newport, OR.

Test and control sediments were sieved through a 0.5 mm screen, and five replicates of each were randomly assigned to one-liter glass test jars. Test temperature was 15 0C. A 2-3 cm deep layer of appropriate sediment was added to each jar and was overlain with water of salinity appropriate for either testing or for salinity adjustment. Each test jar was provided with aeration via Pasteur pipette after sediment had settled. The test was started on either the day after sediment addition or the day following completion of sediment salinity adjustment by randomly assigning 20 amphipods to each jar. The test continued for 10 days under static conditions with constant illumination and aeration. Daily measurements of environmental test conditions (temperature, pH, and dissolved oxygen) were made in each

test container. At the end of the ten-day exposure period, the contents of each jar were poured through a 0.5 mm sieve and the number of surviving amphipods counted.

Survivors from each jar were placed on the surface of clean (home) sediment overlain by seawater at 15°C and the number of amphipods that buried themselves within 2 hours was recorded.

Reference toxicant bioassays were performed using cadmium chloride with each batch of test animals to verify the health and relative sensitivity of that test organism population.

Salinity, pH, dissolved sulfide and total ammonia measurements were made on sediment interstitial water (pore water) as received to ensure that ammonia and sulfide concentrations were below threshold levels for *E. estuarius*. Pore water ammonia and dissolved sulfide measurements were taken from one replicate of each test sediment at test initiation and at test termination.

Methods for Surface Water Survival Toxicity Tests using *Atherinops affinis* Larvae

Surface waters were tested for chronic toxicity using topsmelt (*Atherinops affinis*) larvae according to Chapman et al. (1995).

Topsmelt were obtained from Aquatic Biosystems, Inc., Fort Collins, Colorado, and were 12 days old at test initiation. The topsmelt were acclimated to test conditions for 1 day and were fed and maintained during acclimation and testing as prescribed by the EPA (1995).

Samples were collected by CH2M HILL personnel and transported at 4 °C to the laboratory by Federal Express. The samples arrived at salinities ranging from 23 to 99 ppt and were stored in the dark at 4 °C. The samples were adjusted to 30 ppt by the addition of Tropic Marin artificial sea salts, or were diluted to 30 ppt by the addition of distilled water. The temperature was adjusted to 25 °C on each sample prior to test initiation and each daily renewal.

The chronic tests pre-renewal solutions were monitored for mortality, dissolved oxygen, pH, and salinity at test initiation and every 24 hours thereafter in all test concentrations tested and the control. Pre- and post-renewal solutions were monitored for dissolved oxygen daily. The post-renewal 100 percent sample and laboratory control were monitored for pH daily. Growth was measured by the analysis of dry weights at the conclusion of the topsmelt chronic definitive tests. Temperature was monitored continuously throughout these test periods.

The effects measured during the topsmelt chronic tests included survival and growth over the exposure period.

Methods for Storm Water Survival and Development Toxicity Tests using *Ceriodaphnia dubia*

The test protocol followed EPA Method 1002.0 (EPA, 1994a). *Ceriodaphnia* bioassays were conducted with 10 individuals per concentration, with one animal in each of ten individual polystyrene cups containing approximately 20 mL of test solution. Test temperature was 25 ± 1°C and photoperiod was 16 hours light:8 hours dark. Each test individual was transferred to a fresh cup of test solution daily concurrent with water quality measurements and assessment of individual survival and reproduction (number of offspring). Prior to transfer,

each fresh test cup was inoculated with food (100 µL of a 3:1 mixture of *Selenastrum* culture, density approximately 3.0-3.5 X 106 cells/mL and *Ceriodaphnia* chow).

Synthetic, moderately hard freshwater prepared with E-pure deionized water and reagent chemicals served as laboratory control water and diluent. The laboratory water controls served in the experimental design as evidence of quality assurance. Sample test concentrations were prepared daily during the test. Each sample was poured through a 60µm Nitex screen prior to preparation of test concentrations. Test organisms were <24 hr old and *C. dubia* neonates were derived from in-house cultures. In-house cultures were maintained using laboratory control water at test conditions.

A chronic reference toxicant bioassay using C. dubia was performed synoptically to confirm test organism sensitivity and to demonstrate consistent laboratory performances. The reference toxicant was potassium chloride (KCl) at test concentrations of 0.063, 0.125, 0.250, 0.500, and 1.000 g KCl/L, prepared with synthetic, moderately hard freshwater. Renewals, monitoring, and feeding were performed as in the effluent test.

Methods for Storm Water Survival nad Reproductive Toxicity Tests using *Mysidopsis bahia*

Test methods followed EPA Method 1006 (EPA, 1994b). The method requires daily replacement of test solutions. Sample salinity was adjusted to 25‰ using Forty Fathoms® Brand bioassay grade sea salts. The experimental design called for testing a natural seawater control and a salt control along with each batch of sample waters.

Test organisms were juvenile mysids (*Mysidopsis bahia*), 7 days old, purchased from Aquatic Biosystems, Inc., Fort Collins, CO.

Five test concentrations were prepared from each water sample. Diluted natural seawater was used to prepare test dilutions, and a natural seawater control was also tested. A salt control was prepared using Forty Fathoms® Brand Bioassay Grade sea salt and E-Pure water. Five mysids were used in each test container and there were eight replicate containers per concentration. Mysids in each container were fed three times daily with 400 newly-hatched *Artemia nauplii*. Test temperature was 26ºC ± 1ºC, and photoperiod was 16:8 L:D. Daily renewal of 80% of the 150 mL test volume coincided with daily environmental monitoring and assessment of survival. After seven days of exposure, the test was terminated. Survival was assessed in each container; each surviving mysid was microscopically examined to determine its gender and each female was scored for presence of eggs in the oviduct or brood pouch. Finally, the dry weight of surviving mysids in each replicate was determined.

A chronic reference toxicant bioassay using *M. bahia* was performed synoptically to confirm test organism sensitivity and to demonstrate consistent laboratory performances. The reference toxicant was copper (Cu), prepared with natural seawater diluted to about 22‰. Renewals, monitoring, and feeding were performed as in the effluent test.

Bioaccumulation Exposure Methods

Bioaccumulation assessments followed procedures outlined in EPA/COE (1991), and were performed using the polychaete worm Nereis viriens. Worms were supplied by Aquatic Research Organisms, Hampton, NH. Animals were exposed to test and control sediments in an array of 31-liter flow-through glass aquaria. Five replicates of each test and control

sediment were randomly assigned to the test tanks. The control sediment was collected from Tomales Bay, CA. A 3-cm layer of appropriate sediment was added to each test container. Tanks were then filled with laboratory seawater and allowed to settle overnight. The following morning, the flow-through seawater system was activated and aeration was initiated. A flow rate equivalent to a 90% tank/volume change every 4 hours (7 liters/hour), was maintained until sediment salinity adjustments were completed. Fifteen worms were added to each test container once interstitial interstitial salinities were compatible with animal tolerance. Five percent of the test containers received twenty-five worms to provide sufficient tissue for quality assurance (MS/MSD) during tissue chemical analyses.

Bioaccumulation assessment exposure continued for 28 days. At least twice each day, environmental systems were checked for possible malfunction. Daily monitoring of each tank for temperature, D.O., salinity, pH and unusual behavior was performed.

After exposure, the contents of each tank were gently washed with seawater through a 0.5mm nylon screen from which the animals were retrieved. Surviving worms were transferred to filtered flowing seawater for 24-hours to evacuate their guts. Directly following these treatments, the soft tissues were frozen pending homogenization for chemical analyses. Tissues were stored at -20+5 °C.

Statistical Data Analysis

LC50s and EC50s for bivalve larvae development test and for reference toxicant test data were calculated using the Trimmed Spearman-Karber analysis on the Abbott's corrected data.

Statistical comparisons of data from negative control exposures with data from test sediments or porewaters were made using EPA ToxStat software to yield significant differences (NOEC and LOEC endpoints). Data sets were evaluated for normality (Shapiro-Wilks Test or Chi Square Test) and for homogeneity of variance (Bartlett's Test with Levene's Test). When data were found to be both normal and homogeneous, and control and test data were compared using the parametric ANOVA followed by Dunnett's Multiple Comparison Test to identify data sets that differed significantly from controls. In the data sets that were not normally distributed and/or did not show homogeneity of variance, data were compared using the non-parametric Steel's Many-One Rank Test or Kruskal-Wallace Test.

For the effects measured during the topsmelt chronic tests (survival and growth) over the exposure period, the statistical analyses performed were those outlined in EPA (1995). Dunnett's Procedure or Bonferoni's T-Test was used to compare the survival and growth data between the control and each sample concentration for the chronic tests. When the assumptions of normality or homogeneity of variance necessary for Dunnett's Procedure or T-Test with Bonferoni Adjustment could not be met, Steel's Many-One Rank Test or Wilcoxon Rank Sum with Bonferoni Adjustment was used to analyze the data. IC25 values (the concentration of sample causing a 25 percent reduction in biological measurement, e.g. growth) were also calculated for growth effects in the chronic tests.

References Cited

APHA, 1995. Standard Methods for the Examination of Water and Wastewater. Published by the American Public Health Association, Washington, D.C.

ASTM 1989. Standard Guide for Conducting Acute Toxicity Tests Starting with Embryos of Four Species of Saltwater Bivalve Molluscs. ASTM Designation: E 724-89. American Society for Testing and Materials, Philadelphia, PA.

ASTM 1990. Standard Guide for Conducting 10-day Static Sediment Toxicity Tests with Marine and Estuarine Amphipods. ASTM Designation: E 1367-90. American Society for Testing and Materials, Philadelphia, PA.

Bruland, K.W. and R.P. Franks. 1979. Sampling and Analytical Methods for the Determination of Copper, Cadmium, Zinc, and Nickel at the Nanogram per Liter Level in Seawater. Analytica Chimica Acta. 105(1979) pp. 233-245.

California EPA 1996. Pacific Oyster, Crassostrea gigas and Mussel Mytilus spp. Embryo-Larvae Development Test Method. Appendix M. In: Procedures Manual for Conducting Toxicity Tests Developed by the Marine Bioassay Project. 96-1WQ. January, 1996. State Water Resources Control Board.

CH2M HILL. 2000. Revised Work Plan for Confirmatory Sampling and Ecological Risk Assessment for Bolsa Chica Lowlands Project, Huntington Beach, California. January.

Chapman G.A., D.L. Denton, and J.M. Lazurchak. 1995. Short Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to West Coast Marine and Estuarine Organisms, EPA/600/R-95-136.

Gaudette, et al., 1974. Titration Method for the Determination of Organic Carbon in Marine Sediments. Journal of Sedimentary Petrology, Vol. 44, No. 1, pp 249-253.

Kinnetic Laboratories, Inc. and CH2M HILL, 1999. Bolsa Chica Wetlands Restoration Project Proposed Dredge Areas Sediment Sampling and Analysis Results. Prepared for U.S. Fish and Wildlife Service.

Long, E.R., D.D. MacDonald, S.L. Smith, and F.D. Calder. 1995. Incidence of aAdverse biological effects within ranges of chemical concentrations in marine and estuarine sediments. Environmental Management 19: 81-97.

Plumb, R. H., 1981. Procedures for Handling and Chemical Analysis of Sediment and Water Samples. Environmental Laboratory, U. S. Army Engineer Waterway Experimental Station.

Schaefer Dixon Associates, Inc., 1991. Phase I Environmental Assessment Bolsa Chica 1194 Acre Parcel, Huntington Beach, California. Prepared for the Koll Company, Newport Beach, California. April, 1991.

Tetra Tech, Inc., 1996. Phase II Environmental Assessment for Bolsa Chica Lowlands and Pocket Area, Huntington Beach, California. Report TC0798-05. Prepared for the Bolsa Chica Technical Committee by Tetra Tech, Inc., Pasadena, CA. October, 1996.

U.S. Environmental Protection Agency, 1983. Methods for the Analysis of Waters and Wastes (Revised). U. S. Environmental Monitoring and Support Laboratory. Cincinnati, OH.

U.S. Environmental Protection Agency, 1986. SW-846, Test Methods for Evaluating Solid Waste, First Revision.

U.S. Environmental Protection Agency, 1992. SW-846, Test Methods for Evaluating Solid Waste, Second Revision.

U.S. Environmental Protection Agency. 1994a. Short-term methods for estimating the chronic toxicity of effluents and receiving waters to freshwater organisms. EPA/600/4-91/002. July.

U.S. Environmental Protection Agency. 1994b. Short-term methods for estimating the chronic toxicity of effluents and receiving waters to marine and estuarine organisms. EPA/600/4-91/003. July.

U.S. Environmental Protection Agency, 1995. Method 1664: N-Hexane Extractable Material (HEM) and Silica Gel Treated in N-Hexane Extractable Material (SGT-HEM) by Extraction and Gravimetry (Oil and Grease and Total Petroleum Hydrocarbons). Office of Water, Engineering and Analysis Division. Report EPA-821-13-94-004.

U.S. Environmental Protection Agency/ U.S. Army Corps of Engineers, 1991. Evaluation of Dredged Material Proposed for Ocean Disposal (Testing Manual). U. S. EPA Office of Marine and Estuarine Protection, and Department of the Army, U.S. Army Corps of Engineers. Washington, D.C. EPA-503/8-91/001.

U.S. Environmental Protection Agency/ U.S. Army Corps of Engineers, 1998. Evaluation of Dredge Material Proposed for Discharge in Waters of the U.S. – Testing Manual. Inland Testing Manual. Report EPA-823-B-98.

TABLE A-1
ERA Sampling and Analyses

Cell Number[a] / Core Number and Sample Number	Number of Locations[b] (Cores in Composite)	Media/Suite of Analyses[c]				Toxicity Tests[c]		Laboratory Bioaccumulation[c]
		Sediment			Pore Water			
		Suite C	Suite A	Suite B	Suite D	Sediment	Pore Water	Sediment
Random Sampling and Testing Program								
1 (33.57 acres)	9							
RD-01-01								
RD-01-02								
RD-01-03								
RD-01-04								
RD-01-05								
RD-01-06								
RD-01-07								
RD-01-08								
RD-01-09								
R01C1-2FB	(1,2,4,5)	X			X	X	X	
R01C2-2FB	(6,8,9)	X						
R01C3-1	(3)	X						
R01C3-2			X					
R01C4-1	(7)	X						
R01C4-2			X					
1A (6.30 acres)	1							
RD-01A-01								
R01AC1-1		X						
R01AC1-2			X					
2 (6.79 acres)	2							
RD-02-01								
RD-02-02								
R02C1-1	(1,2)	X			X	X	X	
R02C1-2			X					
3 (28.94 acres)	7							
RD-03-01								
RD-03-02								
RD-03-03								
RD-03-04								
RD-03-05								
RD-03-06								

TABLE A-1
ERA Sampling and Analyses

Cell Number[a]	Number of Locations[b]	Media/Suite of Analyses[c]				Toxicity Tests[c]		Laboratory Bioaccumulation[c]
		Sediment			Pore Water			
Core Number and Sample Number	(Cores in Composite)	Suite C	Suite A	Suite B	Suite D	Sediment	Pore Water	Sediment
RD-03-07								
R03C1-1	(1,2,3)	X			X	X	X	X
R03C1-2			X					
R03C2-1	(7)	X						
R03C2-2			X					
R03C3-2FB	(4,5,6)	X						
R03C3-2FB								
4 (30.44 acres)	7							
RD-04-01								
RD-04-02								
RD-04-03								
RD-04-04								
RD-04-05								
RD-04-06								
RD-04-07								
R04C1-1	(1,2,3)	X						
R04C1-2			X					
R04C2-1	(4,5,6,7)	X			X		X	
R04C2-2			X					
5 (3.06 acres)	1							
RD-05-01								
R05C1-2FB		X						
6 (18.37 acres)	5							
RD-06-01								
RD-06-02								
RD-06-03								
RD-06-04								
RD-06-05								
R06C1-1	(1,2,3,4,5)	X			X		X	
R06C1-2			X					

TABLE A-1
ERA Sampling and Analyses

Cell Number[a] / Core Number and Sample Number	Number of Locations[b] (Cores in Composite)	Media/Suite of Analyses[c]				Toxicity Tests[c]		Laboratory Bioaccumulation[c]
		Sediment			Pore Water			
		Suite C	Suite A	Suite B	Suite D	Sediment	Pore Water	Sediment
7 (8.81 acres)	2							
RD-07-01								
RD-07-02								
R07C1-1	(1,2)	X						
R07C1-2			X					
8 (20.04 acres)	5							
RD-08-01								
RD-08-02								
RD-08-03								
RD-08-04								
RD-08-05								
R08C1-2FB	(1,2,3,4)	X			X	X	X	X
R08C2-1	(5)	X						
R08C2-2			X					
9 (17.8 acres)	4							
RD-09-01								
RD-09-02								
RD-09-03								
RD-09-04								
R09C1-1		X			X		X	
R09C1-2	(1,2,3,4)		X					
10 (16.98 acres)	4							
RD-10-01								
RD-10-02								
RD-10-03								
RD-10-04								
R10C1-1	(1,2,3,4)	X						
R10C1-2			X					
11 (54.21 acres)	14							
RD-11-01								
RD-11-02								
RD-11-03								

TABLE A-1
ERA Sampling and Analyses

Cell Number[a]	Number of Locations[b]	Media/Suite of Analyses[c]				Toxicity Tests[c]		Laboratory Bioaccumulation[c]
		Sediment			Pore Water			
Core Number and Sample Number	(Cores in Composite)	Suite C	Suite A	Suite B	Suite D	Sediment	Pore Water	Sediment
RD-11-04								
RD-11-05								
RD-11-06								
RD-11-07								
RD-11-08								
RD-11-09								
RD-11-10								
RD-11-11								
RD-11-12								
RD-11-13								
RD-11-14								
R11C1-1	(2,3,4,5)	X			X		X	X
R11C1-2			X					
R11C2-1	(7,8,9,12,13,14)	X			X		X	X
R11C2-2			X					
R11C3-1	(1,6,10,11)	X						
R11C3-1			X					
12 (16.85 acres)	4							
RD-12-01								
RD-12-02								
RD-12-03								
RD-12-04								
R12C1-1	(1,2,3,4)	X						
R12C1-2			X					
13 (9.88 acres)	2							
RD-13-01								
RD-13-02								
R13C1-1	(1,2)	X						
R13C1-2			X					

TABLE A-1
ERA Sampling and Analyses

Cell Number[a] / Core Number and Sample Number	Number of Locations[b] (Cores in Composite)	Media/Suite of Analyses[c]				Toxicity Tests[c]		Laboratory Bioaccumulation[c]
		Sediment			Pore Water			
		Suite C	Suite A	Suite B	Suite D	Sediment	Pore Water	Sediment
14 (17.54 acres)	4							
RD-14-01								
RD-14-02								
RD-14-03								
RD-14-04								
R14C1-1	(1,2,3,4)	X			X		X	
R14C1-2			X					
15 (19.09 acres)	5							
RD-15-01								
RD-15-02								
RD-15-03								
RD-15-04								
RD-15-05								
R15C1-2FB	(1,2,3,4)	X						
R15C2-1	(5)	X						
R15C2-2			X					
16 (8.13 acres)	2							
RD-16-01								
RD-16-02								
R16C1-2FB	(1,2)	X						
17 (23.21 acres)	6							
RD-17-01								
RD-17-02								
RD-17-03								
RD-17-04								
RD-17-05								
RD-17-06								
R17C1-2FB	(1,2,3,4,5,6)	X			X		X	X
18 (28.63 acres)	8							
RD-18-01								
RD-18-02								
RD-18-03								

TABLE A-1
ERA Sampling and Analyses

Cell Number[a]	Number of Locations[b]	Media/Suite of Analyses[c]				Toxicity Tests[c]		Laboratory Bioaccumulation[c]
		Sediment			Pore Water			
Core Number and Sample Number	(Cores in Composite)	Suite C	Suite A	Suite B	Suite D	Sediment	Pore Water	Sediment
RD-18-04								
RD-18-05								
RD-18-06								
RD-18-07								
RD-18-08								
R18C1-2FB	(1,2,3,4)	X						
R18C2-2FB	(5,6,7,8)	X						
19 (11.2 acres)	3							
RD-19-01								
RD-19-02								
RD-19-03								
R19C1-1	(1,2,3)	X						
R19C1-2			X					
20 (6.9 acres)	2							
RD-20-01								
RD-20-02								
R20C1-1	(1,2)	X			X		X	
R20C1-2			X					
21 (8.12 acres)	1							
RD-21-02								
R21C1-1	(2)	X						
R21C1-2			X					
22 (6.6 acres)	2							
RD-22-01								
RD-22-02								
R22C1-1	(1,2)	X						
R22C1-2			X					

TABLE A-1
ERA Sampling and Analyses

Cell Number[a]	Number of Locations[b]	Media/Suite of Analyses[c]				Toxicity Tests[c]		Laboratory Bioaccumulation[c]
		Sediment			Pore Water			
Core Number and Sample Number	(Cores in Composite)	Suite C	Suite A	Suite B	Suite D	Sediment	Pore Water	Sediment
25 (3.56 acres)	1							
RD-25-01								
R25-1-1	(1)	X						
R25-1-2			X					
26 (1.5 acres)	1							
RD-26-01								
R26-1-1	(1)	X						
R26-1-2			X					
27 (3.58 acres)	1							
RD-27-01								
R27-1-1	(1)	X						
R27-1-2			X					
28 (2 acres)	1							
RD-28-01								
R28-1-1	(1)	X						
R28-1-2			X					
29 (1 acre)	1							
RD-29-01								
R29-1-1	(1)	X						
R29-1-2			X					
30 (16.7 acres)	5							
RD-30-01								
RD-30-02								
RD-30-03								
RD-30-04								
RD-30-05								
R30C1-1	(1,2,3,4,5)	X			X		X	
R30C1-2			X					

TABLE A-1
ERA Sampling and Analyses

Cell Number[a]	Number of Locations[b]	Media/Suite of Analyses[c]				Toxicity Tests[c]		Laboratory Bioaccumulation[c]
		Sediment			Pore Water			
Core Number and Sample Number	(Cores in Composite)	Suite C	Suite A	Suite B	Suite D	Sediment	Pore Water	Sediment
31 (2.56 acres)	1							
RD-31-01								
R31-1-1	(1)	X						
R31-1-2			X					
32 (17.9 acres)	4							
RD-32-01								
RD-32-02								
RD-32-03								
RD-32-04								
R32C1-1	(1,2,3,4)	X						
R32C1-2			X					
R32C2-1	(1,2,3,4)	X			X		X	
R32C2-2[d]	Suite C resampled	X						
33 (19.7 acres)	5							
RD-33-01								
RD-33-02								
RD-33-03								
RD-33-04								
RD-33-05								
R33C1-1	(1,2,3,4,5)	X						
R33C1-2			X					
34 (27.9 acres)	5							
RD-34-01								
RD-34-02								
RD-34-03								
RD-34-04								
RD-34-05								
34-01-1	(1)	X						
34-01-2			X					
R34C1-1	(2,3,4,5)	X						
R34C1-2			X					
35 (13.13 acres)	3							

TABLE A-1
ERA Sampling and Analyses

Cell Number[a]	Number of Locations[b]	Media/Suite of Analyses[c]				Toxicity Tests[c]		Laboratory Bioaccumulation[c]
		Sediment			Pore Water			
Core Number and Sample Number	(Cores in Composite)	Suite C	Suite A	Suite B	Suite D	Sediment	Pore Water	Sediment
RD-35-01								
RD-35-02								
RD-35-03								
R35C1-1	(1,2,3)	X						
R35C1-2			X					
36 (24.43 acres)	6							
RD-36-01								
RD-36-02								
RD-36-03								
RD-36-04								
RD-36-05								
RD-36-06								
R36C1-1	(1,2,3,4,5,6)	X						
R36C1-2			X					
R36C2-1[d]	(1,2,3,4,5,6)	X						
R36C2-2[d]			X					
37 (5.79 acres)	1							
RD-37-01								
R37-1-1	(1)	X						
R37-1-2			X					
38 (8.84 acres)	2							
RD-38-01								
RD-38-02								
R38C1-1	(1,2)	X			X	X	X	X
R38C1-2			X					
39 (14.18 acres)	4							
RD-39-01								
RD-39-02								
RD-39-03								
RD-39-04								
R39C1-1	(1,2,3,4)	X						

TABLE A-1
ERA Sampling and Analyses

Cell Number[a]	Number of Locations[b]	Media/Suite of Analyses[c]				Toxicity Tests[c]		Laboratory Bioaccumulation[c]
		Sediment			Pore Water			
Core Number and Sample Number	(Cores in Composite)	Suite C	Suite A	Suite B	Suite D	Sediment	Pore Water	Sediment
R39C1-2			X					
40 (24.69 acres)	3							
RD-40-01								
RD-40-02								
RD-40-03								
R40C1-1	(1,2,3)	X			X		X	
R40C1-2			X					
41 (30.65 acres)	8							
RD-41-01								
RD-41-02								
RD-41-03								
RD-41-04								
RD-41-05								
RD-41-06								
RD-41-07								
RD-41-08								
R41C1-1	(1,2,3)	X						
R41C1-2			X					
R41C2-1	(4,5,6,7,8)	X						
R41C2-2			X					
42 (29.19 acres)	6							
RD-42-01								
RD-42-02								
RD-42-03								
RD-42-04								
RD-42-05								
RD-42-06								
R42C1-1	(1,2)	X						
R42C1-2			X					
R42C2-1	(3,4,5,6)	X						
R42C2-2			X					
43 (7.25 acres)	2							

TABLE A-1
ERA Sampling and Analyses

Cell Number[a]	Number of Locations[b]	Media/Suite of Analyses[c]				Toxicity Tests[c]		Laboratory Bioaccumulation[c]
		Sediment			Pore Water			
Core Number and Sample Number	(Cores in Composite)	Suite C	Suite A	Suite B	Suite D	Sediment	Pore Water	Sediment
RD-43-01								
RD-43-02								
R43C1-1	(1,2)	X						
R43C1-2			X					
44 (43.52 acres)	10							
RD-44-01								
RD-44-02								
RD-44-03								
RD-44-04								
RD-44-05								
RD-44-06								
RD-44-07								
RD-44-08								
RD-44-09								
RD-44-10								
R44C1-1	(1,4,5,8,9,10)	X			X		X	
R44C1-2			X					
R44C2-2FB	(2,3,6,7)	X						
45 (26.28 acres)	7							
RD-45-01								
RD-45-02								
RD-45-03								
RD-45-04								
RD-45-05								
RD-45-06								
RD-45-07								
R45C1-1	(1,2,3,4)	X						
R45C1-2			X					
R45C2-1	(5,6,7)	X						
R45C2-2			X					
46 (26.81 acres)	7							
RD-46-01								
RD-46-02								

TABLE A-1
ERA Sampling and Analyses

Cell Number[a]	Number of Locations[b]	Media/Suite of Analyses[c]				Toxicity Tests[c]		Laboratory Bioaccumulation[c]
		Sediment			Pore Water			
Core Number and Sample Number	(Cores in Composite)	Suite C	Suite A	Suite B	Suite D	Sediment	Pore Water	Sediment
RD-46-03								
RD-46-04								
RD-46-05								
RD-46-06								
RD-46-07								
R46C1-1	(1,2,3,4)	X						
R46C1-2			X					
R46C2-1	(5,6,7)	X						
R46C2-2			X					
47 (16.34 acres)	4							
RD-47-01								
RD-47-02								
RD-47-03								
RD-47-04								
R47C1-1	(1,2,3,4)	X						
R47C1-2			X					
48 (24.72 acres)	6							
RD-48-01								
RD-48-02								
RD-48-03								
RD-48-04								
RD-48-05								
RD-48-06								
R48C1-1	(1,2,3,4,5,6)	X						
R48C1-2			X					
49 (12.69 acres)	3							
RD-49-01								
RD-49-02								
RD-49-03								
R49C1-1	(1,2,3)	X						
R49C1-2			X					
50 (18.83 acres)	4							

TABLE A-1
ERA Sampling and Analyses

Cell Number[a]	Number of Locations[b]	Media/Suite of Analyses[c]				Toxicity Tests[c]		Laboratory Bioaccumulation[c]
		Sediment			Pore Water			
Core Number and Sample Number	(Cores in Composite)	Suite C	Suite A	Suite B	Suite D	Sediment	Pore Water	Sediment
RD-50-01								
RD-50-02								
RD-50-03								
RD-50-04								
R50C1-1	(1,2,3)	X						
R50C1-2			X					
R50C2-1	(4)	X						
R50C2-2			X					
R50C3-1[d]	(1,2,3)	X						
R50C3-2[d]			X					
51 (3.21 acres)	1							
RD-51-01								
R51C1-1	(1)	X						
R51C1-2			X					
52 (10.58 acres)	3							
RD-52-01								
RD-52-02								
RD-52-03								
R52C1-1	(1,2,3)	X			X		X	
R52C1-2	(3)		X					
53 (6.43 acres)	2							
RD-53-01								
RD-53-02								
R53C1-1	(1,2)	X			X		X	
55 (30.57 acres)	6							
RD-55-03								
RD-55-04								
RD-55-05								
RD-55-06								
RD-55-07								
RD-55-08								

TABLE A-1
ERA Sampling and Analyses

Cell Number[a]	Number of Locations[b]	Media/Suite of Analyses[c]				Toxicity Tests[c]		Laboratory Bioaccumulation[c]
		Sediment			Pore Water			
Core Number and Sample Number	(Cores in Composite)	Suite C	Suite A	Suite B	Suite D	Sediment	Pore Water	Sediment
R55C1-1	(3,4,5,6,7,8)	X						
R55C1-2			X					
58 (26.44 acres)	6							
RD-58-01								
RD-58-02								
RD-58-03								
RD-58-04								
RD-58-05								
RD-58-06								
RD-58-07								
R58C1-1	(1,2,3,5)	X						
R58C2-2	(3,5)		X					
R58C3-2FB	(4,6,7)	X						
59 (9.98 acres)	2							
RD-59-01								
RD-59-02								
R59C1-1	(1)	X			X		X	
R59C2-2FB	(2)	X						
60 (54.05 acres)	16							
RD-60-01								
RD-60-02								
RD-60-03								
RD-60-04								
RD-60-05								
RD-60-06								
RD-60-07								
RD-60-08								
RD-60-09								
RD-60-10								
RD-60-11								
RD-60-12								
RD-60-13								
RD-60-14								

TABLE A-1
ERA Sampling and Analyses

Cell Number[a]	Number of Locations[b]	Media/Suite of Analyses[c]				Toxicity Tests[c]		Laboratory Bioaccumulation[c]
		Sediment			Pore Water			
Core Number and Sample Number	(Cores in Composite)	Suite C	Suite A	Suite B	Suite D	Sediment	Pore Water	Sediment
RD-60-15								
RD-60-16								
R60C1-1	(1,2,3,4)	X						
R60C2-1	(15)	X						
R60C3-1	(5,6,7,8,9,10)	X						
R60C3-2			X					
R60C1-1	(11,12,13,14,16)	X						
R60C1-2			X					
61 (6.55 acres)	2							
RD-61-01								
RD-61-02								
R61C1-1	(1,2)	X						
R61C2-2	(1)		X					
62 (7.45 acres)	2							
RD-62-01								
RD-62-02								
R62C1-1	(1,2)	X						
R62C1-2			X					
63 (2.50 acres)	3							
RD-63-01								
RD-63-02								
RD-63-03								
R63C1-1	(1,2,3)	X			X		X	
R63C1-2			X					

TABLE A-1
ERA Sampling and Analyses

Cell Number[a] / Core Number and Sample Number	Number of Locations[b] (Cores in Composite)	Media/Suite of Analyses[c]						
		Sediment			Pore Water	Toxicity Tests[c]		Laboratory Bioaccumulation[c]
		Suite C	Suite A	Suite B	Suite D	Sediment	Pore Water	Sediment
66 (4.86 acres)	1							
RD-66-01								
R66-1-1	(1)	X						
R66-1-2			X					
67 (5.35 acres)	1							
RD-67-01								
R67C1-1	(1)	X			X		X	
Inner Bolsa Bay (135.4 acres)	20							
RD-IB-01								
RD-IB-02								
RD-IB-03								
RD-IB-04								
RD-IB-05								
RD-IB-06								
RD-IB-07								
RD-IB-08								
RD-IB-09								
RD-IB-10								
RD-IB-11								
RD-IB-12								
RD-IB-13								
RD-IB-14								
RD-IB-15								
RD-IB-16								
RD-IB-17								
RD-IB-18								
RD-IB-19								
RD-IB-20								
RIBC1-1	(15,16,17,18,19,20)	X						
RIBC1-2					X		X	
RIBC2-1	(10,11,12,13,14)	X						
RIBC3-1	(5,6,7,8,9)	X						
RIBC4-1	(1,2,3,4)	X						

TABLE A-1
ERA Sampling and Analyses

Cell Number[a] / Core Number and Sample Number	Number of Locations[b] (Cores in Composite)	Media/Suite of Analyses[c]				Toxicity Tests[c]		Laboratory Bioaccumulation[c]
		Sediment			Pore Water			
		Suite C	Suite A	Suite B	Suite D	Sediment	Pore Water	Sediment
Outer Bolsa Bay (48.48 acres)	10							
RD-OB-01								
RD-OB-02								
RD-OB-03								
RD-OB-04								
RD-OB-05								
RD-OB-06								
RD-OB-07								
RD-OB-08								
RD-OB-09								
RD-OB-10								
ROBC1-1	(6,7,8,9,10)	X						
ROBC1-2					X	X	X	X
ROBC2-1	(1,2,3,4,5)	X						
Focused Sampling and Test Program								
Sumps (Cell No.)	12							
S-A2-01 (34)		X		X	X	X	X	
S-A1-02 (34)		X	X	X	X	X	X	
S-I-01 (32)		X	X	X	X	X	X	
S-J-01 (30)		X			X	X	X	
S-K-01 (28)		X	X	X	X	X	X	
S-N-01 (14)		X			X	X	X	
S-01-1 (1A)		X		X	X	X	X	X
S-A5-01 (12)		X			X	X	X	
S-A6-01 (12)		X	X	X		X		
3R-01 (3)		X			X	X	X	X
3R-02 (3)		X			X	X	X	
3R-03 (3)		X			X	X	X	X
Roads and Berms (Cell No.)	2							
RB-42 (3/8)		X	X	X		X		
RB-63 (17/60)		X	X	X		X		X

TABLE A-1
ERA Sampling and Analyses

Cell Number[a]	Number of Locations[b]	Media/Suite of Analyses[c]				Toxicity Tests[c]		Laboratory Bioaccumulation[c]
		Sediment			Pore Water			
Core Number and Sample Number	(Cores in Composite)	Suite C	Suite A	Suite B	Suite D	Sediment	Pore Water	Sediment
Wet Gas Lines (Cell No.)	5							
WG06 (45)		X	X	X		X		X
WG07 (42)		X	X	X		X		
WG11 (40)		X			X	X	X	X
WG34 (34)		X	X	X		X		X
WG38 (24)		X	X	X	X	X	X	X
Abandoned Oil Lines (Cell No.)	3							
AOT-04D (34)		X		X		X		X
AOT-05D (23)		X		X	X	X	X	X
AOT-07D (11)		X			X	X	X	X
Existing Oil Lines (Cell No.)	2							
EO-18 (30)		X				X		X
EO-30 (21)		X		X	X	X	X	X
Pig Cleanout Areas (Cell No.)	4							
PC-01-01 (36)		X	X		X	X	X	
PC-01-05 (36)		X	X		X	X	X	
PC-02-01 (51)		X				X		
PC-03-01 (34)		X	X			X		
Tank Farms (Cell No.)	5							
TF-NB-01 (34)		X		X		X		
TF-NB-04 (33)		X		X		X		
TF-SB-02 (14)		X				X		
TF-SB-04 (14)		X				X		
TF-SL-02 (1A)		X		X		X		
Waste Handling Facility (Cell No.)	3							
WH-01 (23)		X			X	X	X	
WH-02 (23)		X				X		
WH-03 (23)		X			X	X	X	

TABLE A-1
ERA Sampling and Analyses

Cell Number[a] / Core Number and Sample Number	Number of Locations[b] (Cores in Composite)	Media/Suite of Analyses[c]				Toxicity Tests[c]		Laboratory Bioaccumulation[c]
		Sediment			Pore Water			
		Suite C	Suite A	Suite B	Suite D	Sediment	Pore Water	Sediment
Sand Blast Area (Cell No.)	2							
SBA-01 (21)		X	X	X	X	X	X	X
SBA-08 (21)		X	X	X		X		
Stormwater (Cell No.)	2							
SW-01 (11)		X				X		
SW-03 (38)		X			X	X	X	X

Note:

[a]For Random Sampling, this column shows the core numbers within each cell (e.g., RD-01-01 is Random Core number 1 in Cell number 1) and the sample number submitted for analysis (e.g., R01C1-2FB or R01C3-1). R01C1-2FB is composite sample number 1 in Cell 1, taken 2 feet below (FB) the expected dredge depth. R01C3-1 is the surface composite sample number 3 within Cell 1 (indicated by "-1"), whereas R01C3-2 is the subsurface composite (indicated by "-2") for the same location(s). Composite subsurface samples were collected from the same cores as the surface samples.
For Focused Sampling, it shows the type of site (e.g., sumps, roads and berms), the location/sample number, and cell number for the location.

[b]This column shows the number of core locations sampled (e.g., 9 in Cell 1) and which cores were included in the various samples (e.g., cores 1,2,4, and 5 were in R01C1-2FB). All Focused samples were analyzed individually (no compositing).

[c]"X" in these columns indicate which chemical analyses or bioassays were performed on the samples.

[d]Field duplicate.

TABLE A-2

Constituents of Concern, Analytical Methods and Target Reporting Limits for Analytical Suites.

		Suite A	Suite A*	Suite B
Analyte	**Method**	**Sediment dry wt (mg/kg or ppm)**	**Sediment dry wt (mg/kg or ppm)**	**Sediment dry wt (mg/kg or ppm)**
Trace Metals				
Arsenic	EPA 7060	1.0	1.0	1.0
Barium	EPA 6010	1.0	1.0	1.0
Beryllium	EPA 6010	1.0	1.0	1.0
Cadmium	EPA 6010	1.0	1.0	1.0
Chromium	EPA 6010	1.0	1.0	1.0
Cobalt	EPA 6010	1.0	1.0	1.0
Copper	EPA 6010	1.0	1.0	1.0
Lead	EPA 7421	1.0	1.0	1.0
Mercury	EPA 7471	0.2	0.2	0.2
Nickel	EPA 6010	1.0	1.0	1.0
Selenium	EPA 7740	1.0	1.0	1.0
Silver	EPA 6010	1.0	1.0	1.0
Thallium	EPA 7841	1.0	1.0	1.0
Vanadium	EPA 6010	1.0	1.0	1.0
Zinc	EPA 6010	20.0	20.0	20.0
PAHs	EPA 8270B			
Acenaphthene	GC-MS	0.2	0.2	--
Acenaphthylene		0.2	0.2	--
Anthracene		0.2	0.2	--
Benzo(a)anthracene		0.2	0.2	--
Benzo(a,e)pyrene		0.2	0.2	--
Benzo(ghi)perylene		0.2	0.2	--
Benzo(k)fluoranthene		0.2	0.2	--
Benzo(b)fluoranthene		0.2	0.2	--
Fluoranthene		0.2	0.2	--
Dibenzo(a,h)anthracen		0.2	0.2	--
Naphthalene		0.2	0.2	--
Indeno(1,2,3-c,d)pyrene		0.2	0.2	--
Fluorene		0.2	0.2	--
Chrysene		0.2	0.2	--
Phenanthrene		0.2	0.2	--
Pyrene		0.2	0.2	--
Total Detectable PAHs		--	--	--
Volatile Organic Compounds	EPA Method 8260A			
Acetone		50	--	--
Benzene		5	--	--
2-Butanone		50	--	--
Carbon disulfide		5	--	--
Chlorobenzene		5	--	--
1,2-dichlorobenzene		5	--	--
1,3-dichlorobenzene		5	--	--
1,4-dichlorobenzene		5	--	--
1,2-dichloroethane		5	--	--
1,2-dichloroethene		5	--	--
Ethylbenzene		5	--	--
2-hexanone		50	--	--
Methylene chloride		5	--	--
4-Methyl-2-pentanone		50	--	--
0n-propylbenzene		5	--	--
Trichloroethene		5	--	--
Tetrachloroethene		5	--	--
Toluene		5	--	--
Xylene(s)		5	--	--

TABLE A-2

Constituents of Concern, Analytical Methods and Target Reporting Limits for Analytical Suites.

		Suite A	Suite A*	Suite B
Analyte	**Method**	**Sediment dry wt (mg/kg or ppm)**	**Sediment dry wt (mg/kg or ppm)**	**Sediment dry wt (mg/kg or ppm)**
Conventionals				
TOC (%)	Gaudette, et al., 1974 (Walkley-Black)	0.1	--	--
TPH-Diesel	EPA 8015M	10	10	10
TPH-Waste Oil	EPA 8015M	20	20	20

TABLE A-2 CONT.
Constituents of Concern, Analytical Methods and Target Reporting Limits for Analytical Suites.

Analyte	Method	Suite C	Suite C*	Suite D	Suite E	Suite E*
		Sediment dry wt (mg/kg or ppm)		Water and Elutriate (Fg/l or ppb)	Tissue wet wt (mg/kg or ppm)	
Trace Metals						
Arsenic	EPA 7061	0.1	0.1	1.0	0.25	0.25
Barium	EPA 6020	0.1	0.1	10	0.1	0.1
Beryllium	EPA 6020	0.1	0.1	5.0	0.1	0.1
Cadmium	EPA 6020	0.1	0.1	0.05	0.1	0.1
Chromium	EPA 6020	0.1	0.1	0.20	0.02	0.02
Cobalt	EPA 6020	0.1	0.1	0.20	0.1	0.1
Copper	EPA 6020	0.1	0.1	0.20	0.1	0.1
Lead	EPA 6020	0.1	0.1	0.10	0.1	0.1
Mercury	EPA 7471	0.02	0.02	0.10	0.02	0.02
Nickel	EPA 6020	0.1	0.1	5.0	0.1	0.1
Selenium	EPA 7741	0.1	0.1	1.0	0.1	0.1
Silver	EPA 6020	0.1	0.1	0.05	0.1	0.1
Thallium	EPA 6020	0.1	0.1	5.0	0.1	0.1
Vanadium	EPA 6020	0.1	0.1	0.20	0.1	0.1
Zinc	EPA 6020	2.0	2.0	5.0	1.0	1.0
Chlorinated Pesticides	EPA 8081					
Aldrin	GC-ECD	0.0005	0.0005	0.01	0.0005	0.0005
Chlordane & related compounds		0.005	0.005	0.1	0.005	0.005
Dieldrin		0.0005	0.0005	0.01	0.0005	0.0005
DDT & derivatives		0.0005	0.0005	0.01	0.0005	0.0005
Endrin & derivatives		0.0005	0.0005	0.01	0.0005	0.0005
Hexachlorocyclohexane isomers		0.0005	0.0005	0.01	0.0005	0.0005
Toxaphene		0.03	0.03	0.15	0.03	0.03
Endosulfan I		0.002	0.002	0.02	0.002	0.002
Endosulfan II		0.0005	0.0005	0.01	0.0005	0.0005
Endosulfan sulphate		0.01	0.01	0.02	0.01	0.01
Arochlor 1242		0.02	0.02	--	0.02	0.02
Arochlor 1254		0.02	0.02	--	0.02	0.02
Arochlor 1260		0.02	0.02	--	0.02	0.02
Total Detectable PCBs		0.02	0.02	--	0.02	0.02
PCB Congeners	EPA 8081					
PCB008	GC-ECD	0.020	--	--	--	--
PCB018		0.020	--	--	--	--
PCB028		0.020	--	--	--	--
PCB044		0.020	--	--	--	--
PCB052		0.020	--	--	--	--
PCB066		0.020	--	--	--	--
PCB101		0.020	--	--	--	--
PCB105		0.010	--	--	--	--
PCB114		0.010	--	--	--	--
PCB118		0.010	--	--	--	--
PCB123		0.010	--	--	--	--
PCB126		0.010	--	--	--	--
PCB128		0.010	--	--	--	--
PCB138		0.010	--	--	--	--
PCB153		0.010	--	--	--	--
PCB170		0.005	--	--	--	--
PCB180		0.005	--	--	--	--
PCB187		0.010	--	--	--	--
PCB195		0.005	--	--	--	--
PCB206		0.005	--	--	--	--
PCB209		0.005	--	--	--	--

TABLE A-2 CONT.
Constituents of Concern, Analytical Methods and Target Reporting Limits for Analytical Suites.

Analyte	Method	Suite C Sediment dry wt (mg/kg or ppm)	Suite C* Sediment dry wt (mg/kg or ppm)	Suite D Water and Elutriate (Fg/l or ppb)	Suite E Tissue wet wt (mg/kg or ppm)	Suite E* Tissue wet wt (mg/kg or ppm)
Phenolic Compounds	EPA 8270B					
Phenol	GC-MS	0.100	--	--	--	--
2-Chlorophenol		0.040	--	--	--	--
2-Methylphenol		0.040	--	--	--	--
4-Methylphenol		0.100	--	--	--	--
2-Nitrophenol		0.040	--	--	--	--
2,4-Dimethylphenol		0.040	--	--	--	--
2,4-Dichlorophenol		0.020	--	--	--	--
4-Chloro-3-methylphenol		0.020	--	--	--	--
2,4,6-Trichlorophenol		0.020	--	--	--	--
2,4,5-Trichlorophenol		0.020	--	--	--	--
2,4-Dinitrophenol		0.200	--	--	--	--
4-Nitrophenol		0.100	--	--	--	--
4,6-Dinitro-2-methylphenol		0.100	--	--	--	--
Total Detectable Phenols		0.100	--	--	--	--
PAHs	EPA 8270B					
Acenaphthene	GC-MS	0.015	0.015	10	0.02	--
Acenaphthylene		0.015	0.015	10	0.02	--
Anthracene		0.015	0.015	10	0.02	--
Benzo(a)anthracene		0.015	0.015	10	0.02	--
Benzo(a,e)pyrene		0.015	0.015	10	0.02	--
Benzo(ghi)perylene		0.015	0.015	10	0.02	--
Benzo(k)fluoranthene		0.015	0.015	10	0.02	--
Benzo(b)fluoranthene		0.015	0.015	10	0.02	--
Fluoranthene		0.015	0.015	10	0.02	--
Dibenzo(a,h)anthracene		0.015	0.015	10	0.02	--
Naphthalene		0.015	0.015	10	0.02	--
Indeno(1,2,3-c,d)pyrene		0.015	0.015	10	0.02	--
Fluorene		0.015	0.015	10	0.02	--
Chrysene		0.015	0.015	10	0.02	--
Phenanthrene		0.015	0.015	10	0.02	--
Pyrene		0.015	0.015	10	0.02	--
Total Detectable PAHs		--	--	--	--	--
Phthalate Esters	EPA 8270B					
Dimethylphthalate	GC-MS	0.015	0.015	--	--	--
Diethylphthalate		0.015	0.015	--	--	--
Di-n-butylphthalate		0.015	0.015	--	--	--
Butylbenzylphthalate		0.015	0.015	--	--	--
Bis(2-ethylhexyl)phthalate		0.015	0.015	--	--	--
Di-n-octylphthalate		0.015	0.015	--	--	--
Total Detectable Phthalates		--	--	--	--	--
Conventionals						
Percent Solids (%)	D2216	0.1	0.1	--	--	--
Grain size	Plumb, 1981	No RL	--	--	--	--
TOC (%)	Gaudette, et al., 1974 (Walkley-Black)	0.1	--	--	--	--
TPH-Diesel	EPA 8015M	10	10	100	--	--
TPH-Waste Oil	EPA 8015M	20	20	500	--	--
Oil & Grease	EPA1664 (HEM)	20	20	--	--	--
Total Sulfides	EPA9030T/ EPA376.1	0.1	--	25	--	--
Water soluble sulfides	EPA9030D/ EPA376.1	0.1	--	25	--	--
Total Ammonia	EPA350.2,	0.5	--	--	--	--

TABLE A-2 CONT.
Constituents of Concern, Analytical Methods and Target Reporting Limits for Analytical Suites.

Analyte	Method	Suite C	Suite C*	Suite D	Suite E	Suite E*
		Sediment dry wt (mg/kg or ppm)		Water and Elutriate (Fg/l or ppb)	Tissue wet wt (mg/kg or ppm)	
pH	350.3 SM9045B	0.1 units	0.1 units --	0.1 units	--	--
Conductivity	EPA 120.1	0.1 Fmhos		0.1 Fmhos	--	--
Sulfate	EPA 300.0S	1.0	--	1.0	--	--
Total Volatile Solids	EPA 160.4	0.1%	--	0.1%	--	--
%Lipids	EPA 1664 (HEM)	--	--	--	100	100

* - indicates modified suite of analyses

TABLE A-3
Random Follow-Up Sampling and Analyses

Composite ID	Affected Cells	Overlapping Sampling Sites	No. of and (Depths of [bgs]) Previous Samples	No. of New Surf. Cores	No. of New Deep Cores	Core Depth (feet)	Location Desig. (Future)	6020 Metals	As	Se	Hg	PCBs	DDT	Dieldrin	Aldrin	Endrin Aldehyde	8080 Suite	8270 Suite	PAHs Only	pthalates only	TPH	Oil and Grease	% Moisture
R02C1-1	2			2	0	0.5	RD-02-01	1	1													1	1
							RD-02-02	1	1													1	1
R03C1-1	3			3	0	0.5	RD-03-01	1		1								1			1	1	1
							RD-03-02	1		1								1			1	1	1
							RD-03-03	1		1								1			1	1	1
R04C1-1	4			3	0	0.5	RD-04-01	1											1		1		1
							RD-04-02	1											1		1		1
							RD-04-03	1											1		1		1
R06C1-1	6			5	0	0.5	RD-06-01												1		1		1
							RD-06-02												1		1		1
							RD-06-03												1		1		1
							RD-06-04												1		1		1
							RD-06-05												1		1		1
R07C1-1	7			2	0	0.5	RD-07-01	1		1						1				1	1	1	1
							RD-07-02	1		1						1				1	1	1	1
R10C1-1	10			4	0	0.5	RD-10-01	1					1							1			1
							RD-10-02	1					1							1			1
							RD-10-03	1					1							1			1
							RD-10-04	1					1							1			1
R11C1-1	11			4	0	0.5	RD-11-02	1	1												1		1
							RD-11-03	1	1												1		1
							RD-11-04	1	1												1		1
							RD-11-05	1	1												1		1
R11C2-1&2	11			0	6	6	RD-11-07	2	1				1								1		2
							RD-11-08	2	1				1								1		2
							RD-11-09	2	1				1								1		2
							RD-11-12	2	1				1								1		2
							RD-11-13	2	1				1								1		2
							RD-11-14	2	1				1								1		2
R11C3-1	11			4	0	0.5	RD-11-01	1	1				1										1
							RD-11-06	1	1				1										1
							RD-11-10	1	1				1										1
							RD-11-11	1	1				1										1
R12C1-1	12			4	0	0.5	RD-12-01	1	1				1							1	1	1	1

TABLE A-3
Random Follow-Up Sampling and Analyses

Composite ID	Affected Cells	Overlapping Sampling Sites	No. of and (Depths of [bgs]) Previous Samples	No. of New Surf. Cores	No. of New Deep Cores	Core Depth (feet)	Location Desig. (Future)	6020 Metals	As	Se	Hg	PCBs	DDT	Dieldrin	Aldrin	Endrin Aldehyde	8080 Suite	8270 Suite	PAHs Only	pthalates only	TPH	Oil and Grease	% Moisture
							RD-12-02	1	1				1							1	1	1	1
							RD-12-03	1	1				1							1	1	1	1
							RD-12-04	1	1				1							1	1	1	1
R13C1	13			2	0	0.5	RD-13-01	1															1
							RD-13-02	1															1
R19C1-1	19			3	0	0.5	RD-19-01	1															1
							RD-19-02	1															1
							RD-19-03	1															1
R20C1-1	20			2	0	0.5	RD-20-01	1									1				1		1
							RD-20-02	1									1				1		1
R21C1-1	21			0	0	0.5																	
R22C1-1	22			2	0	0.5	RD-22-01	1								1					1		1
							RD-22-02	1								1					1		1
R30C1-1	30			5	0	0.5	RD-30-01						1								1		1
							RD-30-02						1								1		1
							RD-30-03						1								1		1
							RD-30-04						1								1		1
							RD-30-05						1								1		1
R32C1-1	32			0	4	6	RD-32-01	2	2	2							2			1	2	2	2
(R32C2-1&2)							Rd-32-02	2	2	2							2			1	2	2	2
							RD-32-03	2	2	2							2			1	2	2	2
							RD-32-04	2	2	2							2			1	2	2	2
R33C1-1	33			5	0	0.5	RD-33-01	1	1				1								1		1
							RD-33-02	1	1				1								1		1
							RD-33-03	1	1				1								1		1
							RD-33-04	1	1				1								1		1
							RD-33-05	1	1				1								1		1
R34C1-1	34			5	0	0.5	RD-34-01	1	1				1										1
							RD-34-02	1	1				1										1
							RD-34-03	1	1				1										1
							RD-34-04	1	1				1										1
							RD-34-05	1	1				1										1
R35C1-1&2	35			0	3	6	RD-35-01	2			***1***						1				1	1	2
							RD-35-02	2			***1***						1				1	1	2

TABLE A-3
Random Follow-Up Sampling and Analyses

Composite ID	Affected Cells	Overlapping Sampling Sites	No. of and (Depths of [bgs]) Previous Samples	No. of New Surf. Cores	No. of New Deep Cores	Core Depth (feet)	Location Desig. (Future)	6020 Metals	As	Se	Hg	PCBs	DDT	Dieldrin	Aldrin	Endrin Aldehyde	8080 Suite	8270 Suite	PAHs Only	pthalates only	TPH	Oil and Grease	% Moisture
							RD-35-03	2			*1*						1				1	1	2
R36C1-1	36			6	0	0.5	RD-36-01	1	1		1						1	1			1	1	1
(R36C2-1)							RD-36-02	1	1		1						1	1			1	1	1
							RD-36-03	1	1		1						1	1			1	1	1
							RD-36-04	1	1		1						1	1			1	1	1
							RD-36-05	1	1		1						1	1			1	1	1
							RD-36-06	1	1		1						1	1			1	1	1
R38C1-1	38			2	0	0.5	RD-38-01	1															1
							RD-38-02	1															1
R39C1-1	39			4	0	0.5	RD-39-01	1															1
							RD-39-02	1															1
							RD-39-03	1															1
							RD-39-04	1															1
R40C1-1	40			3	0	0.5	RD-40-01	1					1										1
							RD-40-02	1					1										1
							RD-40-03	1					1										1
R41C1-1&2	41			0	3	6	RD-41-01	2															2
							RD-41-02	2															2
							RD-41-03	2															2
R41C2-1	41			5	0	0.5	RD-41-04	1					1										1
							RD-41-05	1					1										1
							RD-41-06	1					1										1
							RD-41-07	1					1										1
							RD-41-08	1					1										1
R42C1-1	42			2	0	0.5	RD-42-01	1					1								1		1
							RD-42-02	1					1								1		1
R42C2-1	42			4	0	0.5	RD-42-03	1															1
							RD-42-04	1															1
							RD-42-05	1															1
							RD-42-06	1															1
R43C1-1	43			2	0	0.5	RD-43-01	1															1
							RD-43-02	1															1
R45C1-1	45			4	0	0.5	RD-45-01	1					1								1		1
							RD-45-02	1					1								1		1

TABLE A-3
Random Follow-Up Sampling and Analyses

Composite ID	Affected Cells	Overlapping Sampling Sites	No. of and (Depths of [bgs]) Previous Samples	No. of New Surf. Cores	No. of New Deep Cores	Core Depth (feet)	Location Desig. (Future)	6020 Metals	As	Se	Hg	PCBs	DDT	Dieldrin	Aldrin	Endrin Aldehyde	8080 Suite	8270 Suite	PAHs Only	pthalates only	TPH	Oil and Grease	% Moisture
							RD-45-03	1					1							1			1
							RD-45-04	1					1							1			1
R45C2-1	45			3	0	0.5	RD-45-05	1															1
							RD-45-06	1															1
							RD-45-07	1															1
R46C1-1	46			4	0	0.5	RD-46-01	1					1										1
							RD-46-02	1					1										1
							RD-46-03	1					1										1
							RD-46-04	1					1										1
R46C2-1	46			3	0	0.5	RD-46-05	1					1								1	1	1
							RD-46-06	1					1								1	1	1
							RD-46-07	1					1								1	1	1
R48C1-1	48			6	0	0.5	RD-48-01	1												1	1		1
							RD-48-02	1												1	1		1
							RD-48-03	1												1	1		1
							RD-48-04	1												1	1		1
							RR-48-05	1												1	1		1
							RD-48-06	1												1	1		1
R49C1-1	49			3	0	0.5	RD-49-01													1	1		1
							RD-49-02													1	1		1
							RD-49-03													1	1		1
R50C1-1	50			3	0	0.5	RD-50-01	1					1										1
(R50C3-1)							RD-50-02	1					1										1
							RD-50-03	1					1										1
R52C1-1	52	DCRD-52-01	1 (1.8)	3	0	0.5	RD-52-01	1			1						1		1		1	1	1
		DCRD-52-02	1 (3.6)				RD-52-02	1			1						1		1		1	1	1
							RD-52-03	1			1						1		1		1	1	1
R53C1-1	53	DCRD-53-01	2 (3.2, 6.6)	2	0	0.5	RD-53-01	1									1				1		1
		DCRD-53-02	2 (.75, 6.75)				RD-53-02	1									1				1		1
R55C1-1&2	55	DCRD-55-03	3 (2.5, 5.2, 8.7)	5	1	0.5	RD-55-03	1					1								1		1
						6	RD-55-04	2					1								1		2
		DCRD-55-05	2 (1.0, 7.7)			0.5	RD-55-05	1					1								1		1
		DCRD-55-06	3 (3.0, 5.7, 7.4)			0.5	RD-55-06	1					1								1		1
		DCRD-55-07	3 (1.7, 7.3, 9.2)			0.5	RD-55-07	1					1								1		1

TABLE A-3
Random Follow-Up Sampling and Analyses

Composite ID	Affected Cells	Overlapping Sampling Sites	No. of and (Depths of [bgs]) Previous Samples	No. of New Surf. Cores	No. of New Deep Cores	Core Depth (feet)	Location Desig. (Future)	6020 Metals	As	Se	Hg	PCBs	DDT	Dieldrin	Aldrin	Endrin Aldehyde	8080 Suite	8270 Suite	PAHs Only	pthalates only	TPH	Oil and Grease	% Moisture
		DCRD-55-08	3 (1.8, 5.5, 7.9)			0.5	RD-55-08	1					1								1		1
R58C1-1	58	DCRD_58-01	3(5.1,8.6,10.4)	4	0	0.5	RD-58-01						1								1	1	1
		DCRD-58-02	2 (4.7, 8.3)				RD-58-02						1								1	1	1
							RD-58-03						1								1	1	1
							RD-58-05						1								1	1	1
R60C1-1	60	DCRD-60-01	4(1.6,3.5,6.4,9.4)	4	0	0.5	RD-60-01							1					1				1
		DCRD-60-02	3(4.0,6.1,10.8)				RD-60-02							1					1				1
		DCRD-60-03	2 (4.5, 8.7)				RD-60-03							1					1				1
		DCRD-60-04	1 (10.5)				RD-60-04							1					1				1
R60C3-1	60			6	0	0.5	RD-60-05						1										1
							RD-60-06						1										1
							RD-60-07						1										1
							RD-60-08						1										1
							RD-60-09						1										1
							RD-60-10						1										1
R60C4-1	60			5	0	0.5	RD-60-11						1										1
							RD-60-12						1										1
							RD-60-13						1										1
							RD-60-14						1										1
							RD-60-16						1										1
R61C1-1	61			2	0	0.5	RD-61-01	1															1
		DCRD-61-02	2 (5.7, 7.2)				RD-61-02	1															1
R63C1-1&2	63			0	3	6	RD-63-01	2	1	1							1	1			1	1	2
							RD-63-02	2	1	1							1	1			1	1	2

TABLE A-3
Random Follow-Up Sampling and Analyses

Composite ID	Affected Cells	Overlapping Sampling Sites	No. of and (Depths of [bgs]) Previous Samples	No. of New Surf. Cores	No. of New Deep Cores	Core Depth (feet)	Location Desig. (Future)	6020 Metals	As	Se	Hg	PCBs	DDT	Dieldrin	Aldrin	Endrin Aldehyde	8080 Suite	8270 Suite	PAHs Only	pthalates only	TPH	Oil and Grease	% Moisture
							RD-63-03	2	1	1							1	1			1	1	2
RIBC1-2	IB			6	0	**0.5**	RD-IB-15	1					1							1	1	1	1
							RD-IB-16	1					1							1	1	1	1
							RD-IB-17	1					1							1	1	1	1
							RD-IB-18	1					1							1	1	1	1
							RD-IB-19	1					1							1	1	1	1
							RD-IB-20	1					1							1	1	1	1
RIBC2-1	IB			5	0	0.5	RD-IB-10	1					1								1		1
							RD-IB-11	1					1								1		1
							RD-IB-12	1					1								1		1
							RD-IB-13	1					1								1		1
							RD-IB-14	1					1								1		1
RIBC3-1	IB			5	0	0.5	RD-IB-05	1					1							1	1		1
							RD-IB-06	1					1							1	1		1
							RD-IB-07	1					1							1	1		1
							RD-IB-08	1					1							1	1		1
							RD-IB-09	1					1							1	1		1
RIBC4-1	IB	DCRD-IB-01	3 (19.6)	4	0	0.5	RD-IB-01	1									1		1		1		1
		DCRD-IB-02	1 (6.6)				RD-IB-02	1									1		1		1		1
							RD-IB-03	1									1		1		1		1
							RD-IB-04	1									1		1		1		1
ROBC1-2	OB			5	0	0.5	RD-OB-06	1					1				.	1			1	1	1
							RD-OB-07	1					1					1			1	1	1
							RD-OB-08	1					1					1			1	1	1
							RD-OB-09	1					1					1			1	1	1
							RD-OB-10	1					1					1			1	1	1
ROBC2-1	OB			5	0	0.5	RD-OB-01	1					1					1			1	1	1
							RD-OB-02	1					1					1			1	1	1
							RD-OB-03	1					1					1			1	1	1
							RD-OB-04	1					1					1			1	1	1
							RD-OB-05	1					1					1			1	1	1
TOTALS FOR RANDOM FOLLOW-UP SITES:				170	20			178	47	16	12	0	104	4		4	31	22	19	40	118	57	210

Notes:
BOLD ITALIC indicates bottom sample only

TABLE A-4
CAR Site Sampling and Analyses

CAR Desig.	Affected Cells	Est. Size or Linear Length (acres or feet)	Overlapping Sampling Sites	Est. Size of Over-lapping Sampling Sites	Tetra-Tech Cores Compl.	CH2M Cores Compl.	No. of and (Depths of [bgs]) Previous Samples	No. of New Cores	Core Depth (feet)	Location Desig. (Future)	Suite A*	Suite B	Suite C*
CAR-08	55, 67	6.2	DCRDA-56-02	1				4	6	CAR-08-1		1	1
			DCMN-1	1						CAR-08-2		1	1
										CAR-08-3		1	1
										CAR-08-4		1	1
CAR-09	53, 55	1.2						3	6	CAR-09-1		1	1
										CAR-09-2		1	1
										CAR-09-3		1	1
CAR-10	53	1						3	6	CAR-10-1		1	1
										CAR-10-2		1	1
										CAR-10-3		1	1
CAR-14	58,59	3.1						3	6	CAR-14-1		1	1
										CAR-14-2		1	1
										CAR-14-3		1	1
CAR-15	58	0.6						2	6	CAR-15-1		1	1
										CAR-15-2		1	1
CAR-16	58	0.8						2	6	CAR-16-1		1	1
										CAR-16-3		1	1
CAR-17	60	0.1						2	6	CAR-17-1		1	1
CAR-18	58	0.5						2	6	CAR-18-1		1	1
										CAR-18-2		1	1
CAR-19	58	0.6						2	6	CAR-19-1		1	1
										CAR-19-2		1	1
CAR-20	58	1.2						3	6	CAR-20-1		1	1
										CAR-20-1		1	1
										CAR-20-1		1	1
CAR-21	49	0.2						2	6	CAR-21-1		1	1
										CAR-21-2		1	1
CAR-22	49	0.3						2	6	CAR-22-1		1	1
										CAR-22-2		1	1
CAR-23	49	0.4	S-2	<.4				2	6	CAR-23-1		1	1
										CAR-23-2		1	1
CAR-24	59	1.1						3	6	CAR-24-1		1	1
										CAR-24-2		1	1

TABLE A-4
CAR Site Sampling and Analyses

CAR Desig.	Affected Cells	Est. Size or Linear Length (acres or feet)	Overlapping Sampling Sites	Est. Size of Over-lapping Sampling Sites	Tetra-Tech Cores Compl.	CH2M Cores Compl.	No. of and (Depths of [bgs]) Previous Samples	No. of New Cores	Core Depth (feet)	Location Desig. (Future)	Suite A*	Suite B	Suite C*
										CAR-24-3		1	1
CAR-25	48	0.3						2	6	CAR-25-1		1	1
										CAR-25-2		1	1
CAR-26	47	0.6						2	6	CAR-26-1		1	1
										CAR-26-2		1	1
CAR-27	59	0.6						2	6	CAR-27-1		1	1
										CAR-27-2		1	1
CAR-28	60	0.1						2	6	CAR-28-1		1	1
										CAR-28-2			.
CAR-29	17	0.1						2	6	CAR-29-1		1	1
										CAR-30-2			
CAR-30	17	0.1						2	6	CAR-30-1		1	1
										CAR-30-2			
CAR-31	5	1						3	6	CAR-31-1		1	1
										CAR-31-2		1	1
										CAR-31-3		1	1
CAR-32	4	1.1						3	6	CAR-32-1		1	1
										CAR-32-2		1	1
										CAR-32-3		1	1
CAR-33	4	0.1						2	6	CAR-33-1		1	1
										CAR-33-2			
CAR-34	4	0.1						2	6	CAR-34-1		1	1
										CAR-34-2			
CAR-35	4	0.1						2	6	CAR-35-1		1	1
										CAR-35-2			
CAR-36	4	0.1						2	6	CAR-36-1		1	1
										CAR-36-2			
CAR-37	IB	1.2						3	6	CAR-37-1		1	1
										CAR-37-2		1	1
										CAR-37-3		1	1
CAR-38	6	0.5						2	6	CAR-38-1		1	1
										CAR-38-2		1	1
CAR-39	6	0.5						2	6	CAR-39-1		1	1
										CAR-39-2		1	1

TABLE A-4
CAR Site Sampling and Analyses

CAR Desig.	Affected Cells	Est. Size or Linear Length (acres or feet)	Overlapping Sampling Sites	Est. Size of Over-lapping Sampling Sites	Tetra-Tech Cores Compl.	CH2M Cores Compl.	No. of and (Depths of [bgs]) Previous Samples	No. of New Cores	Core Depth (feet)	Location Desig. (Future)	Suite A*	Suite B	Suite C*
CAR-40	44	0.1						2	6	CAR-40-1		1	1
										CAR-40-2			
CAR-41	44	0.3						2	6	CAR-41-1		1	1
										CAR-41-2		1	1
CAR-42	48	0.9						2	6	CAR-42-1		1	1
										CAR-42-2		1	1
CAR-43	17	0.8						2	6	CAR-43-1		1	1
										CAR-43-2		1	1
CAR-44	17	0.5						2	6	CAR-44-1		1	1
										CAR-44-2		1	1
CAR-45	44	0.7						2	6	CAR-45-1		1	1
										CAR-45-2		1	1
CAR-46	44	0.3						2	6	CAR-46-1		1	1
										CAR-46-2		1	1
CAR-47	46	1.1	S-A10	<.5				2	6	CAR-47-1		1	1
										CAR-47-2		1	1
CAR-48	46	1						3	6	CAR-48-1		1	1
										CAR-48-2		1	1
										CAR-48-3		1	1
CAR-49	46	0.8						2	6	CAR-49-1		1	1
										CAR-49-2		1	1
CAR-50	46	0.3						2	6	CAR-50-1		1	1
										CAR-50-2		1	1
CAR-51	45	1.6	S-A9	<.5				2	6	CAR-51-1		1	1
										CAR-51-2		1	1
CAR-52	18	1.9						3	6	CAR-52-1		1	1
										CAR-52-2		1	1
										CAR-52-3		1	1
CAR-53	IB	2.3						3	6	CAR-53-1		1	1
										CAR-53-2		1	1
										CAR-53-3		1	1
CAR-54	4	0.1						2	6	CAR-54-1		1	1
										CAR-54-2			
CAR-55	4,6	0.9						2	6	CAR-55-1		1	1

TABLE A-4
CAR Site Sampling and Analyses

CAR Desig.	Affected Cells	Est. Size or Linear Length (acres or feet)	Overlapping Sampling Sites	Est. Size of Over-lapping Sampling Sites	Tetra-Tech Cores Compl.	CH2M Cores Compl.	No. of and (Depths of [bgs]) Previous Samples	No. of New Cores	Core Depth (feet)	Location Desig. (Future)	Suite A*	Suite B	Suite C*
										CAR-55-2		1	1
CAR-56	4	0.5						2	6	CAR-56-1		1	1
										CAR-56-2		1	1
CAR-57	4	0.7						2	6	CAR-57-1		1	1
										CAR-57-2		1	1
CAR-58	4	2.6						3	6	CAR-58-1		1	1
										CAR-58-2		1	1
										CAR-58-3		1	1
CAR-59	7	0.4						2	6	CAR-59-1		1	1
										CAR-59-2		1	1
CAR-60	16	0.2						2	6	CAR-60-1		1	1
										CAR-60-2		1	1
CAR-61	44	2.7	S-D	<.5				2	6	CAR-61-1		1	1
										CAR-61-2		1	1
CAR-62	45	0.7	S-B	<.5				2	6	CAR-62-1		1	1
										CAR-62-2		1	1
CAR-63	42	0.8						2	6	CAR-63-1		1	1
										CAR-63-2		1	1
CAR-64	42	0.4						2	6	CAR-64-1		1	1
										CAR-64-2		1	1
CAR-65	42	4.7	S-A8	0.5				4	6	CAR-65-1		1	1
										CAR-65-2		1	1
										CAR-65-3		1	1
										CAR-65-4		1	1
CAR-66	40	12.3	S-C	4				8	6	CAR-66-1		1	1
										CAR-66-2		1	1
										CAR-66-3		1	1
										CAR-66-4		1	1
										CAR-66-5		1	1
										CAR-66-6		1	1
										CAR-66-7		1	1
										CAR-66-8		1	1
CAR-67	7	0.2	S-3R-01	0.2				2	6	CAR-67-1		1	1
										CAR-67-2		1	1

TABLE A-4
CAR Site Sampling and Analyses

CAR Desig.	Affected Cells	Est. Size or Linear Length (acres or feet)	Overlapping Sampling Sites	Est. Size of Over-lapping Sampling Sites	Tetra-Tech Cores Compl.	CH2M Cores Compl.	No. of and (Depths of [bgs]) Previous Samples	No. of New Cores	Core Depth (feet)	Location Desig. (Future)	Suite A*	Suite B	Suite C*
CAR-68	7	0.3	S-3R-02	0.2				2	6	CAR-68-1		1	1
										CAR-68-2		1	1
CAR-69	7	0.2						2	6	CAR-69-1		1	1
										CAR-69-2		1	1
CAR-70	18	0.1						2	6	CAR-70-1		1	1
										CAR-70-2			
CAR-71	18	0.1						2	6	CAR-71-1		1	1
										CAR-71-2			
CAR-72	IB	0.1						2	6	CAR-72-1		1	1
										CAR-72-2			
CAR-73	Whipstock	1.4						3	6	CAR-73-1		1	1
	IB									CAR-73-2		1	1
										CAR-73-3		1	1
CAR-74	Whipstock	20	RD-01A-02	1				13	6	CAR-74-1		1	1
	1A		RDA-01A-02	1						CAR-74-2		1	1
			MN8	1						CAR-74-3		1	1
			RDA-01A-03	1						CAR-74-4		1	1
			RDA-01A-04	1						CSRR-74-5		1	1
			S-S	<.5						CAR-74-6		1	1
			S-T	<.5						CAR-74-7		1	1
										CAR-74-8		1	1
										CAR-74-9		1	1
										CAR-74-10		1	1
										CAR-74-11		1	1
										CAR-74-12		1	1
										CAR-74-13		1	1
CAR-75	IB	1.9						3	6	CAR-75-1		1	1
										CAR-75-2		1	1
										CAR-75-3		1	1
CAR-76	3, 8	9	DCRDA-03-08	1				5	6	CAR-76-1		1	1
			DCRDA-03-09	1						CAR-76-2		1	1
			DCRDA-03-10	1						CAR-76-3		1	1
			S-3R	1						CAR-76-4		1	1
										CAR-76-5		1	1

TABLE A-4
CAR Site Sampling and Analyses

CAR Desig.	Affected Cells	Est. Size or Linear Length (acres or feet)	Overlapping Sampling Sites	Est. Size of Over-lapping Sampling Sites	Tetra-Tech Cores Compl.	CH2M Cores Compl.	No. of and (Depths of [bgs]) Previous Samples	No. of New Cores	Core Depth (feet)	Location Desig. (Future)	Suite A*	Suite B	Suite C*
CAR-77	8	1.3						3	6	CAR-77-1		1	1
										CAR-77-2		1	1
										CAR-77-3		1	1
CAR-78	8	0.7						2	6	CAR-78-1		1	1
										CAR-78-2		1	1
CAR-79	8	0.9						2	6	CAR-79-1		1	1
										CAR-79-2		1	1
CAR-80	14	0.2						2	6	CAR-80-1		1	1
										CAR-80-2		1	1
CAR-81	19	2.6						3	6	CAR-81-1		1	1
										CAR-81-2		1	1
										CAR-81-3		1	1
CAR-82	19, 29	1.5						3	6	CAR-82-1		1	1
										CAR-82-2		1	1
										CAR-82-3		1	1
CAR-83	30	0.6						2	6	CAR-83-1		1	1
										CAR-83-2		1	1
CAR-84	30	0.2	S-G	0.1				2	6	CAR-84-1		1	1
										CAR-84-2		1	1
CAR-85	32	1.2						3	6	CAR-85-1		1	1
										CAR-85-2		1	1
										CAR-85-3		1	1
CAR-86	30	0.2						2	6	CAR-86-1		1	1
										CAR-86-2		1	1
CAR-87	30	0.2	S-J	0.1				2	6	CAR-87-1		1	1
										CAR-87-2			
CAR-88	32	0.2	S-I	0.15				2	6	CAR-88-1		1	1
										CAR-88-2			
CAR-89	IB	0.9						2	6	CAR-89-1		1	1
										CAR-89-2			
CAR-90	1	1.9	S-Q	0.1				2	6	CAR-90-1		1	1
										CAR-90-2			
CAR-91	1	0.2						2	6	CAR-91-1		1	1
										CAR-91-2		1	1

TABLE A-4
CAR Site Sampling and Analyses

CAR Desig.	Affected Cells	Est. Size or Linear Length (acres or feet)	Overlapping Sampling Sites	Est. Size of Over-lapping Sampling Sites	Tetra-Tech Cores Compl.	CH2M Cores Compl.	No. of and (Depths of [bgs]) Previous Samples	No. of New Cores	Core Depth (feet)	Location Desig. (Future)	Suite A*	Suite B	Suite C*
CAR-92	10	0.1						2	6	CAR-92-1		1	1
										CAR-92-2			
CAR-93	10	0.2						2	6	CAR-93-1		1	1
										CAR-93-2		1	1
CAR-94	9	0.9						2	6	CAR-94-1		1	1
										CAR-94-2		1	1
CAR-95	14	3.5	S-L	0.1				0	6				
			S-M	0.1									
			S-N	0.1									
			SBTF	3									
CAR-96	28	0.2						2	6	CAR-96-1		1	1
										CAR-96-2		1	1
CAR-97	21, 27, 26	7.4	SB	1				6	6	CAR-97-1		1	1
										CAR-97-2		1	1
										CAR-97-3		1	1
										CAR-97-4		1	1
										CAR-97-5		1	1
										CAR-97-6		1	1
CAR-98	33	0.4						2	6	CAR-98-1		1	1
										CAR-98-2		1	1
CAR-99	26	0.3						2	6	CAR-99-1		1	1
										CAR-99-2		1	1
CAR-100	32, 33, 63	13.1	S-U	<.5				6	6	CAR-100-1		1	1
			S-X	1						CAR-100-2		1	1
			S-V	0.5						CAR-100-3		1	1
			PC-03	0.1						CAR-100-4		1	1
			NBTF	3						CAR-100-5		1	1
										CAR-100-6		1	1
CAR-101	37	0.1						2	6	CAR-101-1		1	1
										CAR-101-2			
CAR-102	37	0.3						2	6	CAR-102-1		1	1
										CAR-102-2		1	1
CAR-103	35	1.8	S-W	0.2				2	6	CAR-103-1		1	1
										CAR-103-2		1	1

TABLE A-4
CAR Site Sampling and Analyses

CAR Desig.	Affected Cells	Est. Size or Linear Length (acres or feet)	Overlapping Sampling Sites	Est. Size of Over-lapping Sampling Sites	Tetra-Tech Cores Compl.	CH2M Cores Compl.	No. of and (Depths of [bgs]) Previous Samples	No. of New Cores	Core Depth (feet)	Location Desig. (Future)	Suite A*	Suite B	Suite C*
CAR-104	34	2.4	S-Z	0.1				2	6	CAR-104-1		1	1
										CAR-104-2		1	1
CAR-105	35	0.4						2	6	CAR-105-1		1	1
										CAR-105-2		1	1
CAR-106	35	0.5	S-Y	0.1				2	6	CAR-106-1		1	1
										CAR-106-2		1	1
CAR-107	1	0.1						2	6	CAR-107-1		1	1
										CAR-107-2			
CAR-108	1A	0.1	S-R	<.1				2	6	CAR-108-1		1	1
										CAR-108-2			
CAR-110	12	1.2						3	6	CAR-110-1		1	1
										CAR-110-2		1	1
										CAR-110-3		1	1
CAR-111	OFFSITE	2	S-A6	0.1				2	6	CAR-111-1		1	1
			S-A7	0.1						CAR-111-2		1	1
CAR-112	23, 24	14.4	WHF	7		WH-01	1(.5)	13	6	CAR-112-1		1	1
						WH-02	1(.5)			CAR-112-2		1	1
						WH-03	1(.5)			CAR-112-3		1	1
					B-12		2 (.5mo, 4mo)			CAR-112-4		1	1
										CAR-112-5		1	1
										CAR-112-6		1	1
										CAR-112-7		1	1
										CAR-112-8		1	1
										CAR-112-9		1	1
										CAR-112-10		1	1
										CAR-112-11		1	1
										CAR-112-12		1	1
										CAR-112-13		1	1
CAR-113	33	0.1						2	6	CAR-113-1		1	1
										CAR-113-2			
CAR-114	34	0.5						2	6	CAR-114-1		1	1
										CAR-114-2		1	1
CAR-115	34	2.7	S-A1	0.1				2	6	CAR-115-1		1	1
										CAR-115-2		1	1

TABLE A-4
CAR Site Sampling and Analyses

CAR Desig.	Affected Cells	Est. Size or Linear Length (acres or feet)	Overlapping Sampling Sites	Est. Size of Over-lapping Sampling Sites	Tetra-Tech Cores Compl.	CH2M Cores Compl.	No. of and (Depths of [bgs]) Previous Samples	No. of New Cores	Core Depth (feet)	Location Desig. (Future)	Suite A*	Suite B	Suite C*
CAR-129	44	0.6						2	6	CAR-129-1		1	1
										CAR-129-2		1	1
CAR-130	IB	1						3	6	CAR-130-1		1	1
										CAR-130-2		1	1
										CAR-130-3		1	1
TOTALS FOR UNCHARACTERIZED SITES:								273			0	251	251

Notes:

* - Indicates modified suite of analyses (see Table A-2).

TABLE A-5
Partially Characterized Site Sampling and Analyses

Focus ID	Affected Cells	Est. Size or Linear Length (acres or feet)	Overlapping Sampling Sites	Est. Size of Over-lapping Sampling Sites	Tetra-Tech Cores Compl.	CH2M Cores Compl.	No. of and (Depths of [bgs]) Previous Samples	No. of New Surf. Cores	No. of New Deep Cores	Core Depth (feet)	Location Desig. (Future)	Suite A*	Suite B	Suite C*	8081 Suite
FOCUSED SITES WITH PARTIAL CHARACTERIZATION															
Sand Blast															
SBA	21	1				SBA-01	3 (.5, 2, 4)	0	0	4					
						SBA-08	3 (.5, 2, 4)								
					SS-33		1 (.5mo)								
					SS-36		1 (.5mo)								
					B-26		2 (.5mo, 4o)								
					B-27		2 (.5mo, 4o)								
					SS-35		1 (.5m)								
					SS-37		1 (.5m)								
					SS-38		1 (.5m)								
					B13		2 (.5mo, 4o)								
Tank Farms															
SLTF	1A	2				TF-SL-02	2 (.5, 2-4)	0	0	4	TF-SL-01				
					B-7		2 (.5mo, 4o)				TF-SL-03				
NBTF	33,34	4.5				TF-NB-01	2 (.5, 2-4)	0	0		TF-NB-02				
						TF-NB-04	1 (.5)								
					B-1		2 (.5o,6mo)								
					B-2		2 (.5o, 6o)								
					B-3		2 (.5o, 6mo)								
SBTF	14	2.5				TF-SB-01	2 (.5, 2-4)	0	0	4	TF-SB-02				
						TF-SB-04	2 (.5, 2-4)								
					B-4		2 (.5mo, 6o)								
					B-5		2 (.5o, 6mo)								
					B-6		2 (.5mo, 6o)								
Old KOBE					B-8		2 (.5mo, 4mo)	0	1	4	OKOB-01		2	1	
					B-9		2 (.5mo, 4mo)								
Waste Handling	23	7	Sampled as CARR-112					0	0	6					
Sumps															
S-A	48	<.5			BS-47		2 (.5mo, 4mo)	0	1	6	S-A-01	1	1	1	
S-A1	35	<.5	CARR-115			S-A1-02	3 (.5, 3, 6)	0	0	6					
					BS-6		2 (.5mo, 4mo)								
					BS-7		2 (.5mo, 4mo)								
					BS-8		2 (.5mo, 4mo)								
S-A2	34	<.5				S-A2-01	3 (.5, 3, 6)	0	0						

TABLE A-5
Partially Characterized Site Sampling and Analyses

Focus ID	Affected Cells	Est. Size or Linear Length (acres or feet)	Overlapping Sampling Sites	Est. Size of Over-lapping Sampling Sites	Tetra-Tech Cores Compl.	CH2M Cores Compl.	No. of and (Depths of [bgs]) Previous Samples	No. of New Surf. Cores	No. of New Deep Cores	Core Depth (feet)	Location Desig. (Future)	Suite A*	Suite B	Suite C*	8081 Suite
					BS-20		2 (.5mo, 4mo)								
S-A3	26	<.5			BS-19		2 (.5mo, 4mo)	0	1	6	S-A3-01	1	1	1	
S-A4	26	<.5			BS-18		2 (.5mo, 4mo)	0	1	6	S-A4-01	1	1	1	
S-A5	12	<.5	CARR-110			S-A5-01	3 (.5, 3, 6)	0	0	6					
					BS-3		3(.5mo,3mo,4mo)								
					BS-4		3(.5mo,3mo,4mo)								
S-A6	36	<.5	CARR-111			S-A6-01	3 (.5, 3, 6)	0	0	6					
					BS-1		2 (.5mo, 4mo)								
S-A7	36	<.5	CARR-111		BS-20		2 (.5mo, 4mo)	0	1	6	S-A7-01	1	1	1	
S-A8(1)	36	<.5	CARR-111		BS-39		2 (.5mo, 4mo)	0	1	6	S-A8(1)-01	1	1	1	
					BS-40		2 (.5mo, 4mo)								
S-A8(2)	42	0.5	CARR-65					0	2	6	S-A8(2)-01	1	1	1	
											S-A8(2)-02		2	1	
S-A9	45	0.5			BS-44		2 (.5mo, 4mo)	0	1	6	S-A9-01	1	1	1	
					BS-45		2 (.5mo, 4mo)								
S-A10	46	<.5	CARR-47		BS-46		2 (.5mo, 4mo)	0	1	6	S-A10-01	1	1	1	
S-B	45	0.5	CARR-62		BS-43		2 (.5mo, 4mo)	0	1	6	S-B-01	1	1	1	
S-C	40	5	CARR-66		BS-37		2 (.5mo, 4mo)	0	3	6	S-C-01	1	1	1	
					BS-38		2 (.5mo, 4mo)				S-C-02		2	1	
											S-C-03		2	1	
S-D	43	<.5	CARR-61		BS-41		2 (.5mo, 4mo)	0	1	6	S-D-01	1	1	1	
					BS-42										
S-E	39,40	<.5			BS-36		2 (.5mo, 4mo)	0	1	6	S-E-01	1	1	1	
S-F	30	<.5						0	2	6	S-F-01	1	1	1	
											S-F-02		2	1	
S-G	30	0.5	CARR-84		BS-35		2 (.5mo, 4mo)	0	1	6	S-G-01	1	1	1	
S-H	30	0.5			BS-34		2 (.5mo, 4mo)	0	1	6	S-H-01	1	1	1	
S-I	32	0.5	CARR-88			S-I-01	3 (.5, 3, 6)	0	0	6					
					BS-30		2 (.5mo, 4mo)								
S-J	30	<.5	CARR-87			S-J-01	3 (.5, 3, 6)	0	0	6					
					BS-33		2 (.5mo, 4mo)								
S-K	28	<.5				S-K-01	3 (.5, 3, 6)	0	0	6					
					BS-32		2 (.5mo, 4mo)								
S-L	14	0.5	CARR-95		BS-16		2 (.5mo, 4mo)	0	1	6	S-L-01	1	1	1	
S-M	14	<.5	CARR-95		BS-17		2 (.5mo, 4mo)	0	1	6	S-M-01	1	1	1	
S-N	14	0.5	CARR-95			S-N-01	3 (.5, 3, 6)	0	0	6					
					BS-15		2 (.5mo, 4mo)								
S-O	8	0.5			BS-14		2 (.5mo, 4mo)	0	1	6	S-O-01	1	1	1	

TABLE A-5
Partially Characterized Site Sampling and Analyses

Focus ID	Affected Cells	Est. Size or Linear Length (acres or feet)	Overlapping Sampling Sites	Est. Size of Over-lapping Sampling Sites	Tetra-Tech Cores Compl.	CH2M Cores Compl.	No. of and (Depths of [bgs]) Previous Samples	No. of New Surf. Cores	No. of New Deep Cores	Core Depth (feet)	Location Desig. (Future)	Suite A*	Suite B	Suite C*	8081 Suite
S-P	1	0.5			BS-13		3(.5mo,3mo,4m)	0	1	6	S-P-01	1	1	1	
S-Q	1	<.5	CARR-90			S-01-1	3 (.5, 3, 6)	0	0	6					
					BS-12		2 (.5mo, 4mo)								
S-R	1A	<.5	CARR-108		BS-10		2 (.5mo, 4mo)	0	1	6	S-R-01	1	1	1	
S-S	1A	<.5	CARR-74		BS-9		3(.5mo,3mo,4mo)	0	1	6	S-S-01	1	1	1	
S-T	1A	<.5	CARR-74		BS-5		2 (.5mo, 6mo)	0	1	6	S-T-01	1	1	1	
S-U	34	<.5	CARR-100		BS-29		2 (.5mo, 4mo)	0	1	6	S-U-01	1	1	1	
S-V	34	0.5	CARR-100		BS-27		2 (.5mo, 4mo)	0	1	6	S-V-01	1	1	1	
					BS-28		2 (.5mo, 4mo)								
S-W	35	<.5	CARR-103		BS-24		2 (.5m0, 4mo)	0	1	6	S-W-01	1	1	1	
S-X	37	1	CARR-100		BS-26		2 (.5mo, 4mo)	0	1	6	S-X-01	1	1	1	
S-Y	35	<.5	CARR-106		BS-23		2 (.5mo, 4mo)	0	1	6	S-Y-01	1	1	1	
S-Z	34	0.5	CARR-104		BS-22		2 (.5mo, 4mo)	0	1	6	S-Z-01	1	1	1	
S-2	49	<.5	CARR-23		BS-48		2 (.5mo, 4mo)	0	1	6	S-2-01	1	1	1	
S-3R	3	3	CARR-67			3R-01	3 (.5, 3, 6)	0	0	6					
			CARR-68			3R-02	3 (.5, 3, 6)								
			CARR-76			3R-03	3 (.5, 3, 6)								
					BS-14		2 (.5mo, 4mo)								
Abandoned Oil Lines		~14,000													
AOT-01								18	0	0.5	AOT-		1		1
						AOT-04D	3 (.5, 2, 4)				AOT-		1		
											AOT-		1		1
AOT-02						AOT-05D	3 (.5, 2, 4)				AOT-		1		
											AOT-		1		1
					OL-02		1 (.5mo)				AOT-		1		
AOT-03											AOT		1		1
						AOT-07D	3 (.5, 2, 4)				AOT-		1		
											AOT-		1		1
AOT-04											AOT-		1		
											AOT-		1		1
AOT-05											AOT-		1		
											AOT-		1		1
AOT-06											AOT-		1		
											AOT-		1		1
											AOT-		1		
AOT-07											AOT-		1		1

TABLE A-5
Partially Characterized Site Sampling and Analyses

Focus ID	Affected Cells	Est. Size or Linear Length (acres or feet)	Overlapping Sampling Sites	Est. Size of Over-lapping Sampling Sites	Tetra-Tech Cores Compl.	CH2M Cores Compl.	No. of and (Depths of [bgs]) Previous Samples	No. of New Surf. Cores	No. of New Deep Cores	Core Depth (feet)	Location Desig. (Future)	Suite A*	Suite B	Suite C*	8081 Suite
											AOT-		1		
Existing Oil Lines (Full Tidal)	Must rename locations	~30,000				EO-18	2 (.5, 2-4)	11	0	0.5	EO-		1		1
						EO-30	2 (.5, 2-4)				EO-		1		
					OL-38		1 (.5mo)				EO-		1		1
					OL-39		1 (.5mo)				EO-		1		
					OL-40		1 (.5m)				EO-		1		1
											EO-		1		
											EO-		1		1
											EO-		1		
											EO-		1		1
											EO-		1		
											EO-		1		1
Wet Gas Line (Contam.)	Must redo map	5 known hot spots													
WGT-06						WG06	3 (.5, 3, 6)	0	0	0.5					
					WG-6		1 (.5mo)								
WGT-07						WG07	3 (.5, 3, 6)	0	0	0.5					
					WG-7		1 (.5mo)								
WGT-08					WG-15		1 (.5mo)	0	0	0.5					
											WGT-08D				
WGT-09					WG-16		1 (.5mo)	0	0	0.5					
											WGT-09D				
WGT-05					WG-36		1 (.5mo)	0	0	0.5					
											WGT-05D				
Wet Gas (All Other)	must redo map	19,000			10 surface		10 (.5mo)	10	0	0.5	WG-		1		1
					1 to 4 ft		2 (.5mo, 4m)				WG-		1		1
						WG-11	3 (.5, 3, 6)				WG-		1		1
						WG-34	3 (.5, 3, 6)				WG-		1		1
						WG-38	3 (.5, 3, 6)				WG-		1		1
											WG-		1		1
											WG-		1		1
											WG-		1		1

TABLE A-5
Partially Characterized Site Sampling and Analyses

Focus ID	Affected Cells	Est. Size or Linear Length (acres or feet)	Overlapping Sampling Sites	Est. Size of Over-lapping Sampling Sites	Tetra-Tech Cores Compl.	CH2M Cores Compl.	No. of and (Depths of [bgs]) Previous Samples	No. of New Surf. Cores	No. of New Deep Cores	Core Depth (feet)	Location Desig. (Future)	Suite A*	Suite B	Suite C*	8081 Suite
											WG-		1		1
											WG-		1		1
Pig Clean Out Areas	Redefine Areas on Map														
PC-01		<1				PC-01-01	2 (.5, 3-6)	0	0	6	PC-01-02				
						PC-01-05	2 (.5, 3-6)				PC-01-03				

TABLE A-5
Partially Characterized Site Sampling and Analyses

Focus ID	Affected Cells	Est. Size or Linear Length (acres or feet)	Overlapping Sampling Sites	Est. Size of Over-lapping Sampling Sites	Tetra-Tech Cores Compl.	CH2M Cores Compl.	No. of and (Depths of [bgs]) Previous Samples	No. of New Surf. Cores	No. of New Deep Cores	Core Depth (feet)	Location Desig. (Future)	Suite A*	Suite B	Suite C*	8081 Suite
					SS-09		1 (.5mo)				PC-01-04				
					SS-10		1 (.5mo)				PC-01-06				
					SS-11		1 (.5mo)								
					B-19		2 (.5mo, 4m)								
PC-02		<1				PC-02-01	2 (.5, 3-6)	0	0	6	PC-02-02				
					SS-12		1 (.5mo)				PC-02-03				
					SS-13		1 (.5mo)				PC-02-04				
					SS-14		1 (.5mo)				PC-02-05				
					B-21		4 (.5mo, 4m)				PC-02-06				
PC-03		<1				PC-03-01	2 (.5, 3-6)	0	0	6	PC-03-02				
					B-20		4 (.5mo, 4m)				PC-03-03				
											PC-03-04				
											PC-03-05				
											PC-03-06				
Existing 14" Dry Gas Line Full Tidal Only	Map	5,500			DG-1		2 (.5mo, 4mo)	3	0	0.5	DG-02	1			1
					DG-2		1 (4mo)				DG-03	1			1
							1 (4m)				DG-04	1			1
											DG-05				
											DG-06				
Roads and Berms (every 2,000) FULL TIDAL		110,000				RB-42	3 (.5, 1.5, 3)	0	0	3					
						RB-63	3 (.5, 1.5, 3)								
					25 Surface		10 (.5mo)								
							15 (.5o)								
					12 to 4 ft		6 (4mo)								
							6(4o)								
Inflows			R52-C1-1&2			SW-01	1 (.5)	1	0	0.5	SW-02			1	
						SW-03	1 (.5)								
TOTALS FOR PARTIALLY CHARACTERIZED FOCUSED SITES:								43	34			32	78	35	28

Notes:

* - Indicates modified suite of analyses (see Table A-2).

#mo - metals and organics

#m - metals only

#o - organics only